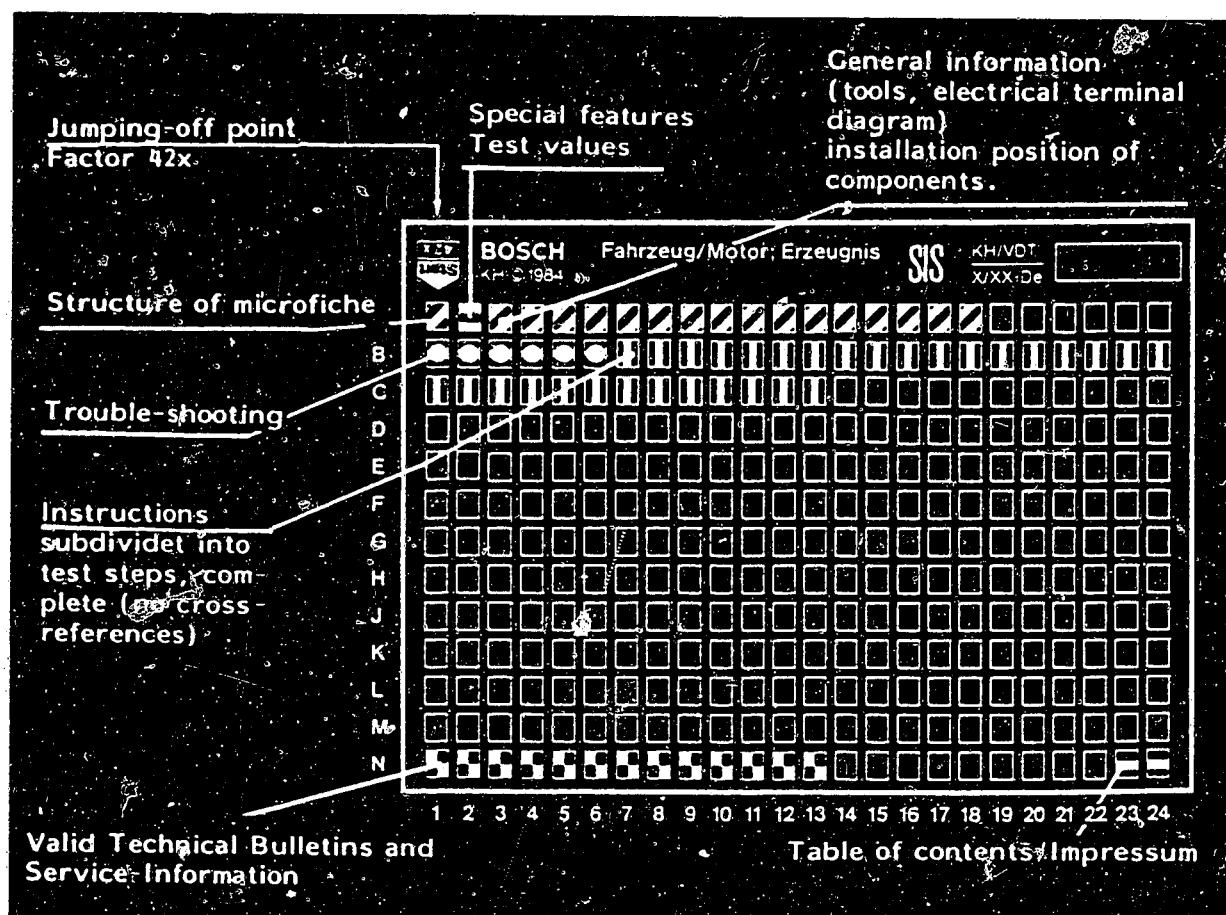


# Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

<b>E 16</b>	Product/component/test step
	Vehicle/engine

↑ Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

**C6**

<b>A1</b>	Trouble-shooting program	
-----------	--------------------------	--

## 1. Special features

The vehicle is equipped with:

Ignition trigger box	0 227 100 124	(with current limitation)
Ignition coil	1 227 020 009	
Timing advance device	0 227 921 011	

## 2. Test specifications

Primary ignition coil	0.6...1.0 $\Omega$	<b>B9</b>
Secondary ignition coil	6.4...11.1 k $\Omega$	

Basic ignition setting at 800...1200 min <sup>-1</sup> engine oil 60°C	10° BTDC	<b>B15</b>
--	----------	------------

In order to avoid incorrect setting, be absolutely certain to do test starting from coordinates B15.

Power supply Ignition trigger box with engine at idle	max. 1 V less than $V_B$	<b>B21</b>
---	-----------------------------	------------

Power supply Ignition coil with engine at idle	$\geq 10$ V	
--	-------------	--

Primary voltage with engine at idle	295 ... 365 V	<b>B23</b>
--	---------------	------------

Power supply Magnetic pulse generator	$\geq 10$ V	<b>C4</b>
--	-------------	-----------

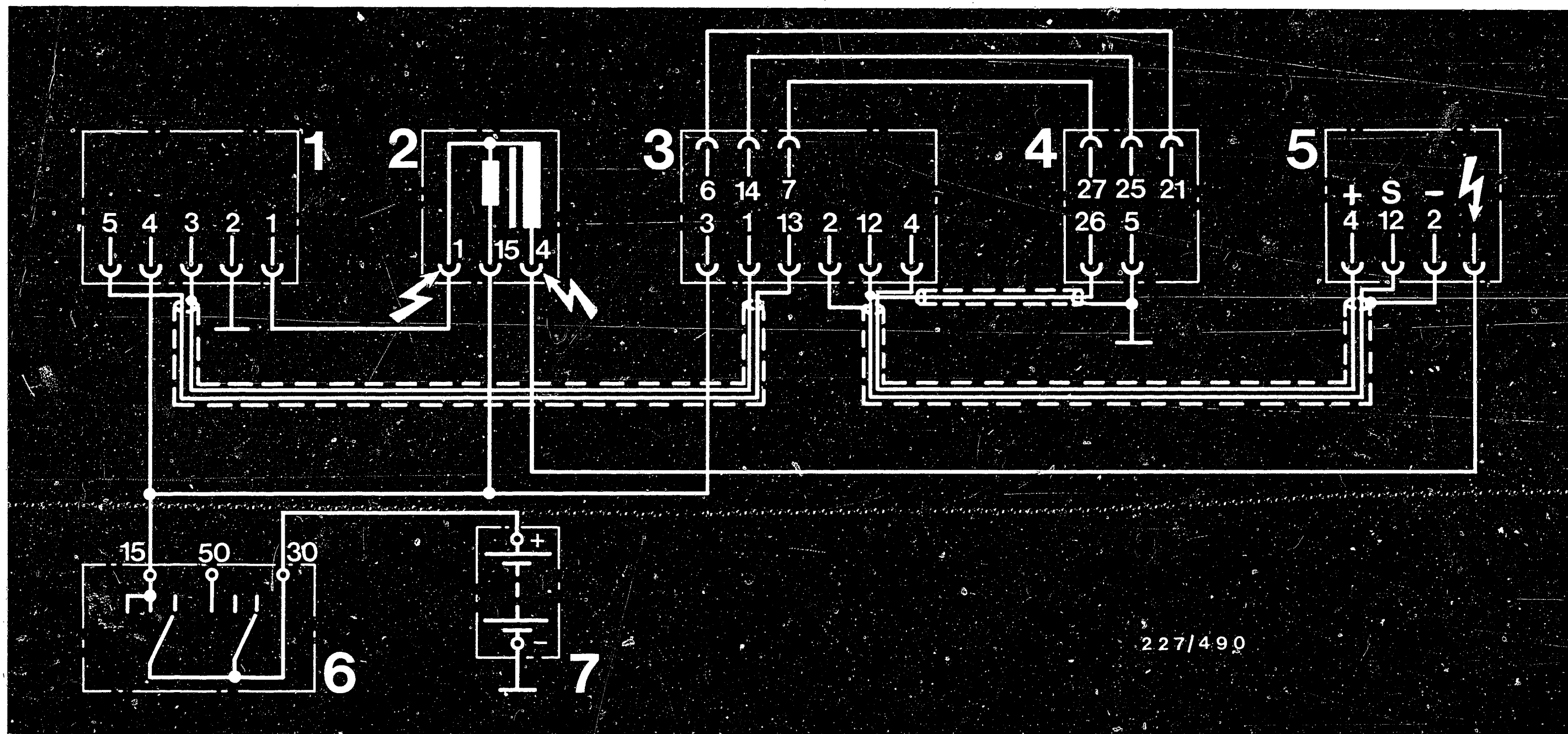
For setting values for ignition, idle speed, exhaust gas, valve clearance, etc., see "Auto Data" test specifications.

**A2**

Test specifications

Opel





⚡ = dangerous voltages  
(400 V - 25 kV)

1 = Ignition trigger box  
2 = Ignition coil  
3 = Timing advance device  
4 = Ecotronic control unit

5 = Ignition distributor  
6 = Ignition-starting switch  
7 = Battery

### 3. Electrical connection diagram

**A3**

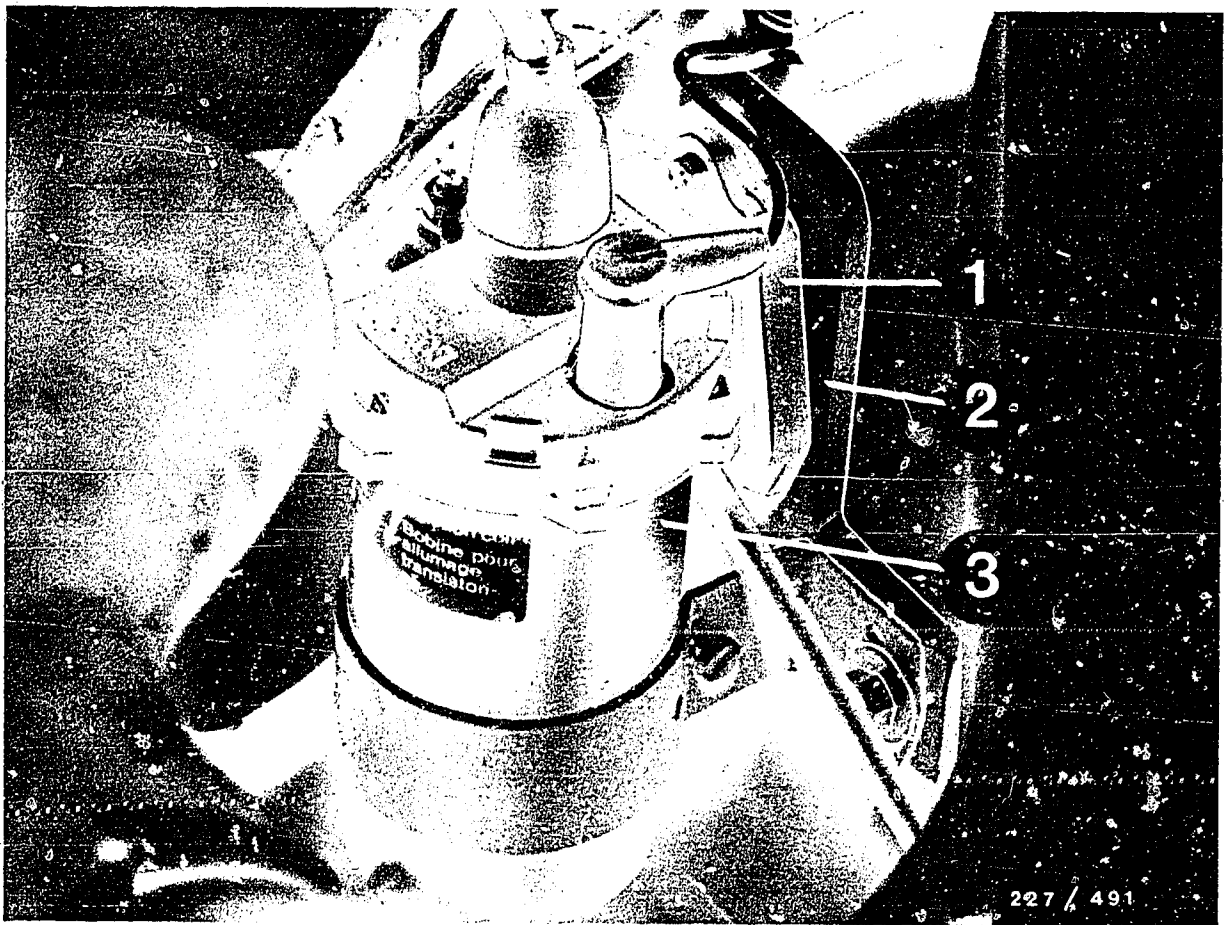
Electrical connection diagram  
Ope1



**A4**

Electrical connection diagram  
Ope1





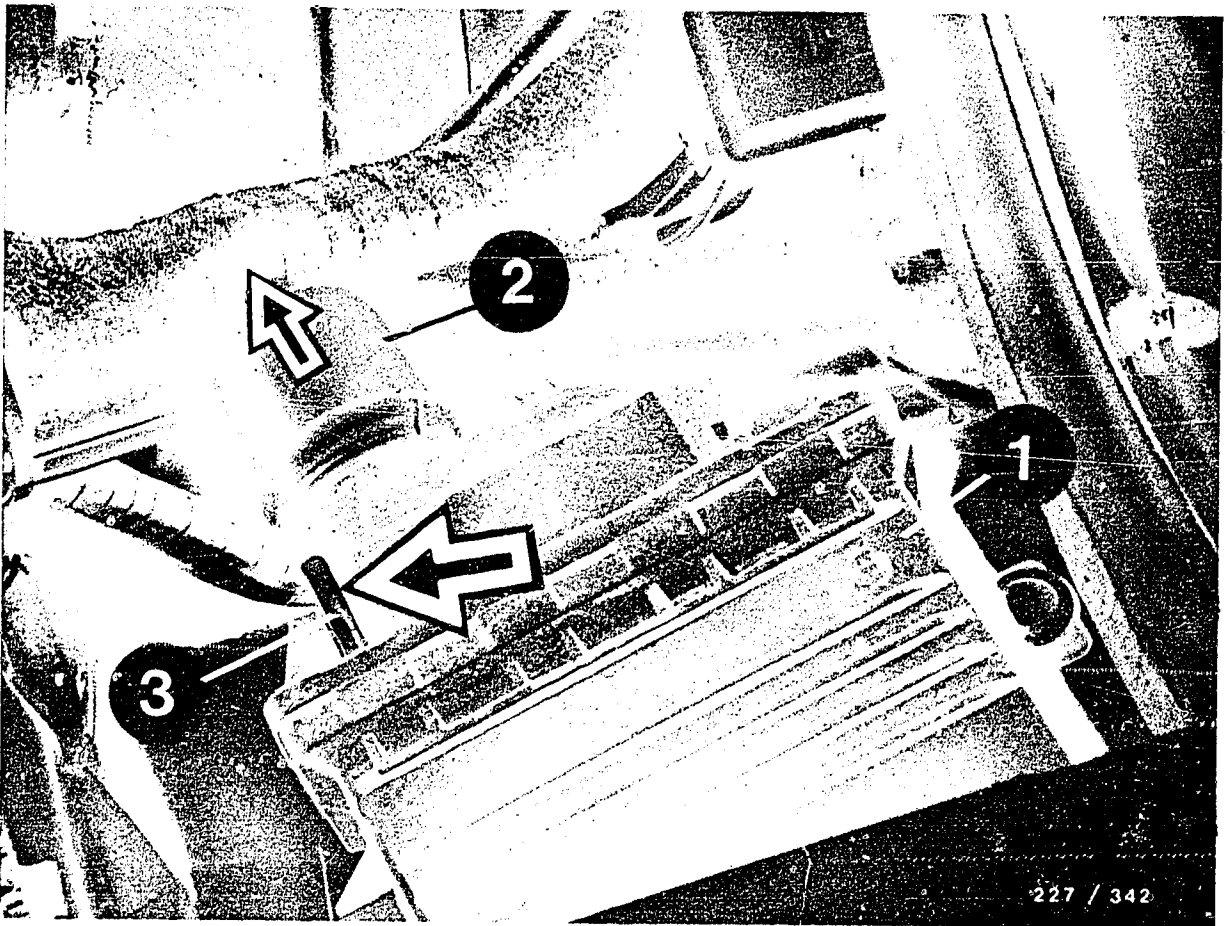
- 1 = TI trigger box
- 2 = Heat sink
- 3 = Ignition coil

#### 4. Installation position of components

The trigger box and ignition coil are mounted on a common heat sink. See picture.







- 1 = Timing advance unit
- 2 = Timing advance unit plug
- 3 = Detent

The timing advance unit is on the wheelbox on the left-hand side in the forward direction of travel. See picture.

How to remove:

To be able to remove the plug, the timing advance unit must be removed.

Press detent for timing advance unit plug in direction of arrow, and hinge plug in direction of arrow.

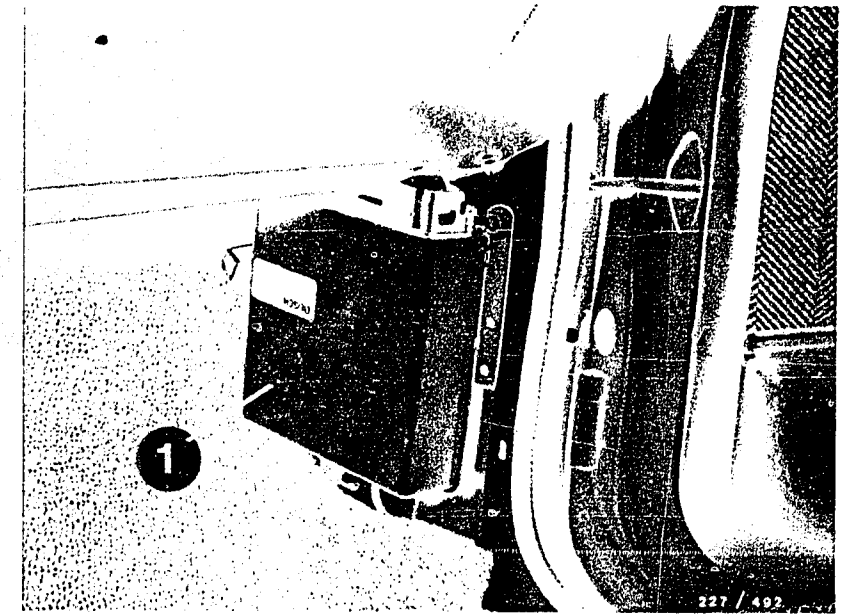


The Ecotronic control unit is located at the front right in the passenger compartment. Figure at top.

Instructions for taking out:

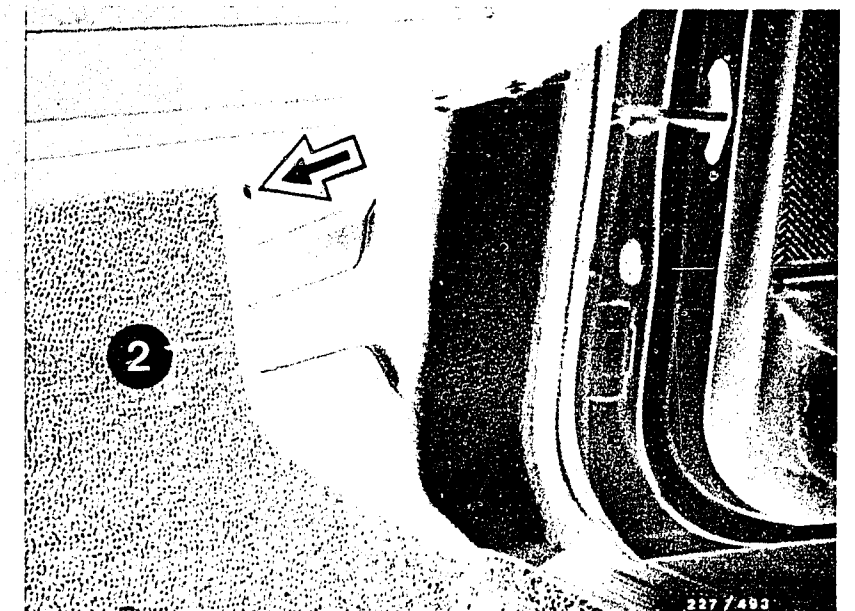
Pull out the plug (arrow, figure at bottom) and take off the side wall panel.

To pull out the Ecotronic control unit plug, take out the control unit.



1 = Ecotronic control unit

2 = Side panel



**A7**

Installation position of the components

Open



**A8**

Installation position of the components

Open



## 5. Necessary test equipment, aids

Motortester e. g.	MOT 201	0 684 000 201
Spark gap e. g. ignition coil and condenser tester or single spark gap	EFAW 106 A EF 1177/7	0.681 100 001 1 684 531 000
5 k $\Omega$ sleeve-type suppressor		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e. g.	Pontavi Wh2	commercially available
Voltmeter e. g.	ETE 014.00	0 684 101 400
Thermal conduction paste		5 942 860 003

Test prods  
(for proper connection  
of test instruments to  
connection plugs)

commercially available

Test leads  
(for proper connection  
of test instruments to  
connection plugs)

KDZS 0004

**A9**

Test equipment, tools required  
Open



## 6. Danger of accident. on electronic ignition systems

Increased demands of modern engines on the ignition system combined with the desire for freedom of maintenance have recently led to electronic ignition systems being fitted as standard. Usually the ignition power of electronic systems (of almost all manufacturers) is higher than that of conventional systems, and there are signs of further increases in power. Electronic ignition systems thus reach a power range which can be highly dangerous if live parts of terminals are touched (both on the primary as well as the secondary sides).

In this connection we should like to point out that the VDE regulations, in particular VDE 0104/7.67 and/or the respective national regulations must be followed when testing or working on the ignition system.

The ignition should always be switched off when working on the ignition system (switch off ignition or voltage source). Such work includes:

- Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacing parts of the ignition system (spark plug, ignition coil, ignition distributor, ignition cable etc.).



If, while testing the ignition system or during adjustment work on the engine (e. g. Ecotronic ), it becomes necessary to switch on the ignition (switch on ignition or voltage source), the above-mentioned dangerous voltages occur over the entire system.

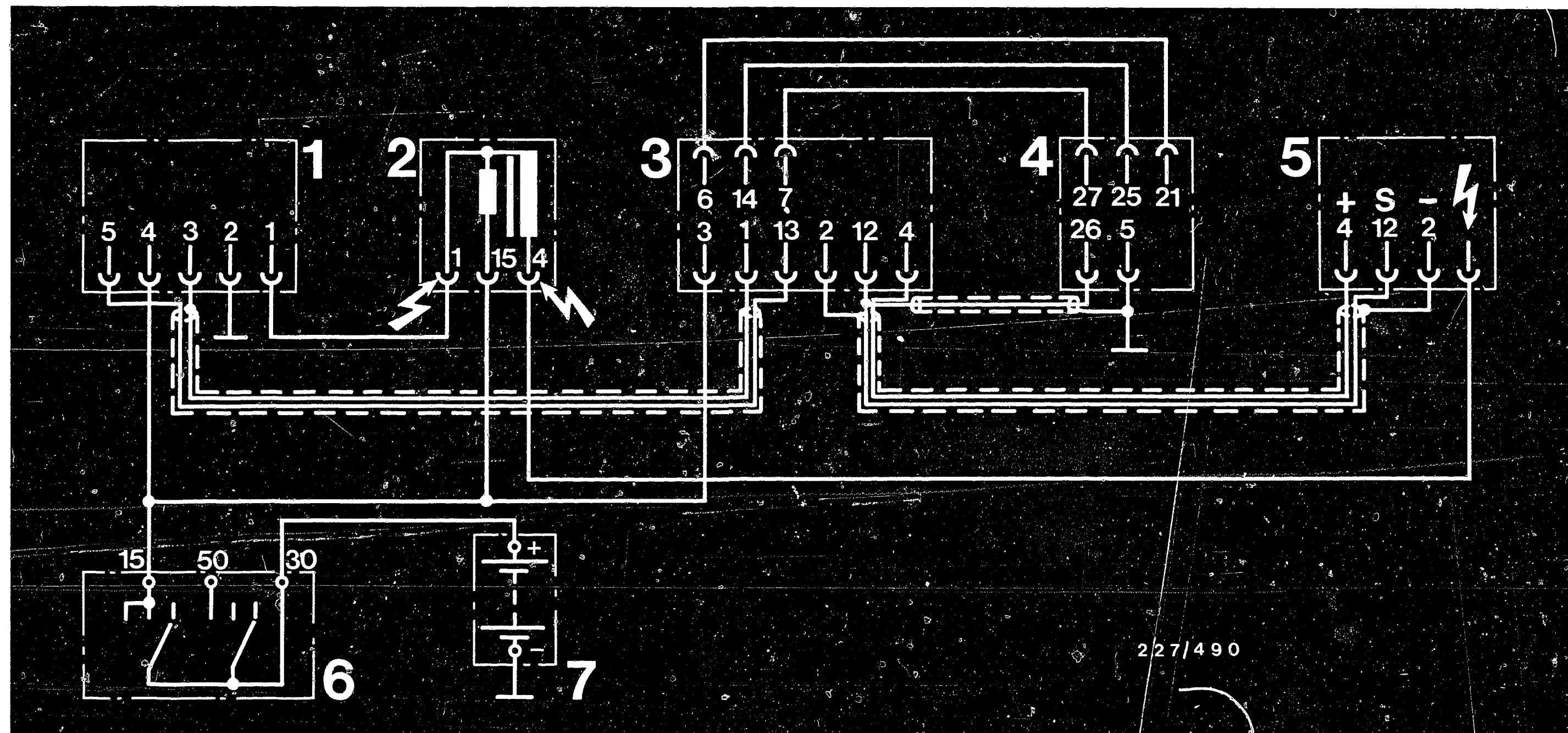
The danger of accident exists, therefore, not only on the individual assemblies of the ignition system (e. g. ignition distributor, ignition coil, trigger box, ignition harness), but also on the wiring harness (e. g. tachometer connection, diagnostic plug), at plug-in connections and test equipment.

**A11**

Danger of accident

Open





227/490

⚡ = dangerous voltages  
(400 V - 25 kV)

1 = Ignition trigger box  
2 = Ignition coil  
3 = Timing advance device  
4 = Ecotronic control unit

5 = Ignition distributor  
6 = Ignition-starting switch  
7 = Battery

### 3. Electrical connection plan

Using the example of the connection diagram for an electronic ignition system, the dangerous points have been identified using high voltage arrows.



7. Incorrect indication of engine speed, dwell angle  
and ignition point

In ignition systems with trigger box 0 227 100 124  
( TZ ) with current limitation there may be an incorrect  
indication of engine speed, dwell angle and ignition  
point on testers.

For further details see coordinates N 8 - N 12

**A14**

Incorrect indication of testers

Opel



## 8. Important vehicle information

- Resistance measurements must only be performed with the ignition switched off or with the battery disconnected (measuring instrument defective).
- During the compression test, either pull off the trigger-box plug or f i r m l y connect terminal 4 of the ignition coil to ground using an extra cable (dangerous voltages, insulation damage at ignition coil, ignition distributor, ignition harness).

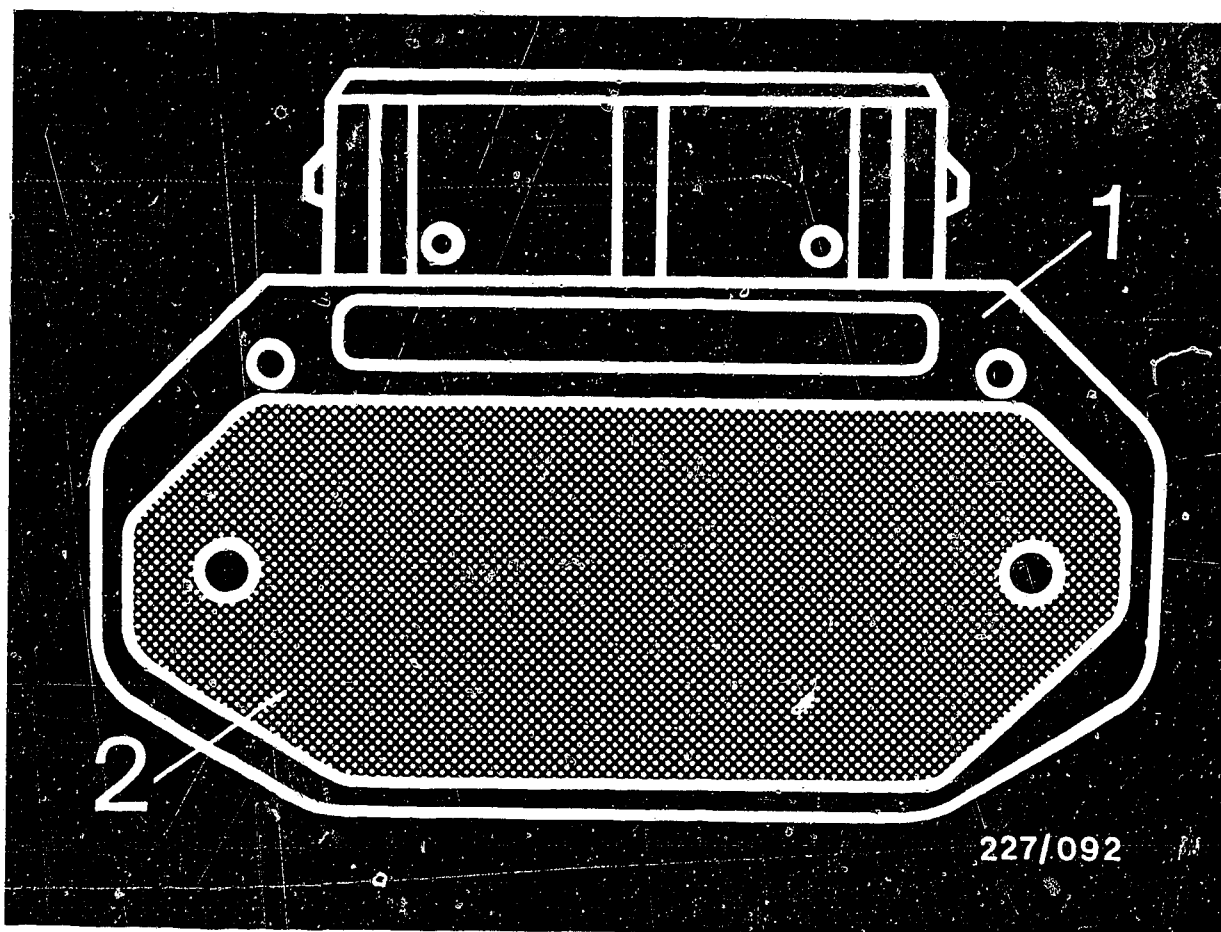
### Note:

The extra cable must be suppressed with at least  $2\text{ k } \Omega$ , e. g. with sleeve-type suppressor ( $5\text{ k } \Omega$ ) 0 356 500 001.

- The specified ignition coil (see Part No.) must not be replaced with a different ignition coil.
- No suppression capacitor must be connected to ignition coil terminal 1 and terminal 15.
- Ignition coil terminal 1 must not be brought into contact with ground as a theft-proofing measure (ignition coil will be destroyed when ignition is switched on).
- No battery + or test lamp must be connected to ignition coil terminal 1 (trigger box will be destroyed).
- Ignition cable from ignition coil terminal 4 to ignition distributor terminal 4 must not be disconnected during operation.
- There must be no arcing from ignition coil terminal 4 to ignition coil terminal 1 and 15.  
The magnetic pulse generator and the ignition trigger box can be destroyed.







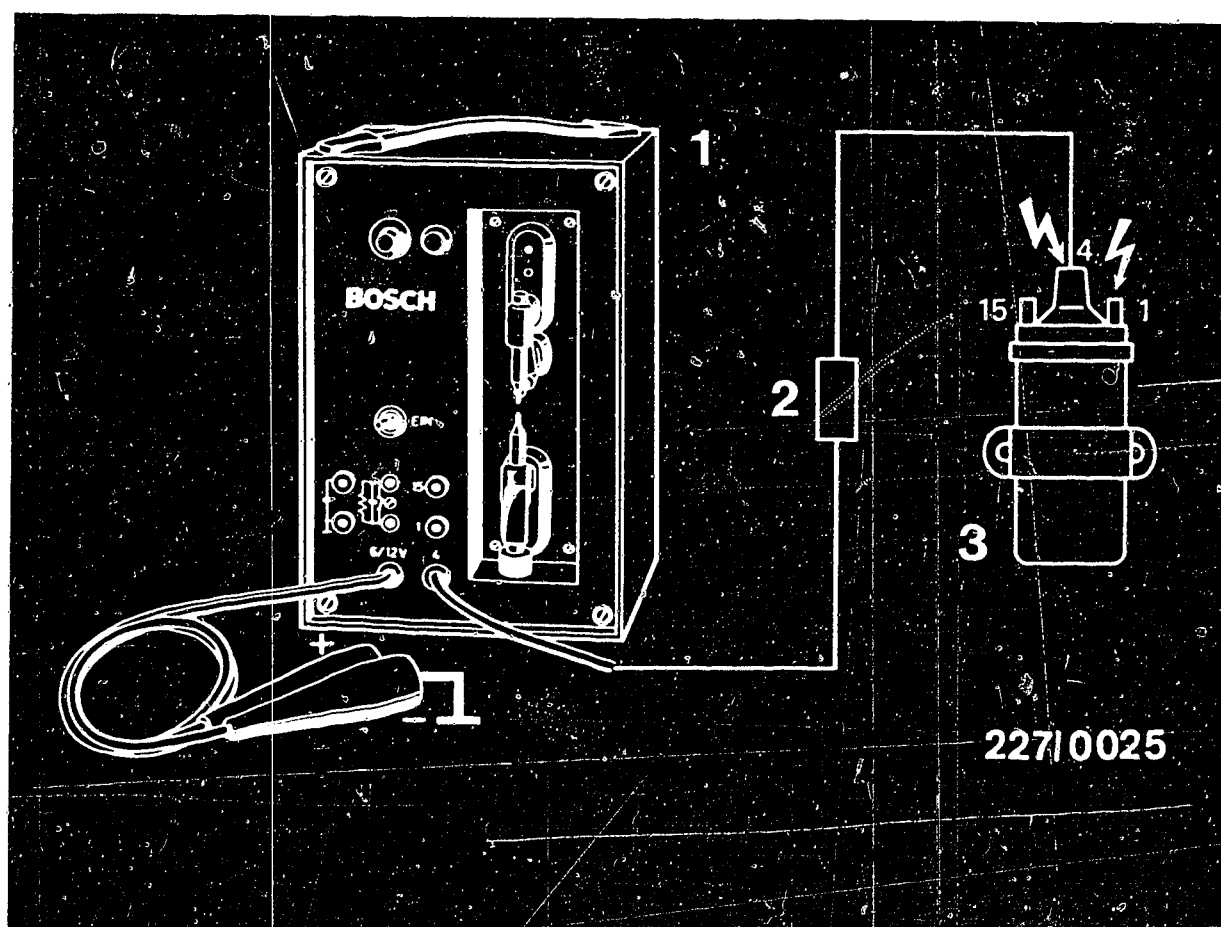
1 = Trigger box

2 = Base plate

- Before mounting the trigger box, the base plate must be coated with thermal conduction paste. Apply thermal conduction paste only with a suitable object (screwdriver, matchstick etc.)

Do not apply thermal conduction paste to painted parts.





- 1 = Spark gap
- 2 = 5 k $\Omega$  sleeve-type suppressor
- 3 = Ignition coil

⚡ = dangerous voltages (400 V - 25 kV)

- In order to prevent the trigger box from being irreparably damaged, when using a spark gap, an interference-suppression resistor of at least 2 k $\Omega$  must be connected between the spark gap and ignition coil terminal 4, e. g. sleeve-type suppressor (5 k $\Omega$ ) 0 356 500 001.

- In order to prevent the trigger box from being irreparably damaged, the secondary side of the ignition system must have at least 2 k  $\Omega$  interference suppression whereby the original distributor rotor with 1 k  $\Omega$  interference-suppression resistor must be fitted (even in the case of radio and spark interference suppression do not use a 5 k  $\Omega$  distributor rotor).
- It is not permissible to connect any outside source of voltage, e.g., ohmmeter, to the magnetic pulse generator (Hall generator).

Caution when switching over measuring ranges.

- The holding springs of the distributor cap must not drop into the pickup system when the engine is being cranked and with the dust-protection cover removed.
- Flashover or flash-through on the ignition distributor cap (poor insulation) can destroy the magnetic pulse generator and the ignition trigger box.
- Do not disconnect battery with engine running.
- If the battery terminals are incorrectly connected, the magnetic pulse generator, the ignition trigger box, and the ignition coil, the timing advance device, and the Ecotronic control unit are destroyed.
- Do not use a starting aid with more than 16 V or a fast charger for starting.



## 9. Trouble-shooting

### 9.1 How to use the trouble-shooting chart

The trouble-shooting chart starting on Coordinate B 3 contains customer complaint (fault symptom), cause of trouble, test instructions and coordinate references.

The possible cause of the fault should be selected from the trouble-shooting chart in accordance with the customer complaint. (fault symptom).

If the cause of the fault is not clear, start testing with the detailed, self-contained trouble-shooting program beginning on Coordinate B 7

If the cause of the fault is clear from the trouble-shooting chart, direct trouble-shooting is possible by going to the stated coordinate without having to perform the entire trouble-shooting program for each fault.

If there is no coordinate reference, trouble-shooting must be performed in accordance with the "Test instructions" column.

### 9.2 Procedure - trouble-shooting program

The trouble-shooting program starting on Coordinate B 7 is divided into 3 rows of boxes.

The left-hand row contains test instructions and test specifications.

The center row contains repair instructions.

The right-hand row contains the illustrations/terminal diagrams belonging to the text and the explanations of the items in the picture.

If the questions asked in the left-hand row can be answered conclusively with "yes", then proceed to the next test down.

If the answer to the question is "no", branch to the center row and carry out the tests given there.

### 9.3 Before testing, make sure of the following:

Battery fully charged, fuel system O.K., engine mechanically O.K. (e. g. compression, valve clearance etc.). Ambient temperature/ignition system temperature 0° to 100° C (temperature has a considerable effect on measured values).

**B1**

Trouble-shooting  
Opel

**B2**

Trouble-shooting  
Opel



# 9.4 Trouble-shooting chart

## Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

Cause of fault

Test instructions

Coordinate

•	•	•	•	•	•	•	•	•	Unclear	Perform detailed trouble-shooting	B 7
•	•	•	•	•	•		•		Spark plugs defective	Assessment by means of ignition oscilloscope or visual examination of spark plug when removed	----
•	•	•	•	•					Shunt on secondary side	Assessment of ignition oil, ignition distributor, ignition harness and spark plug by means of ignition oscilloscope or visual examination	----
•	•	•	•	•					Open circuit on secondary side	Assessment of ignition coil, ignition distributor, ignition harness and spark plug by means of ignition oscilloscope, or continuity test with ohmmeter	----
•									Open circuit on primary side	--	C 1
•	•	•	•	•					Ignition coil defective	-	B 9
		•	•	•	•				Interference-suppression resistors defective	Assessment by means of ignition oscilloscope or resistance measurement	----

B3

Trouble-shooting chart

Opel



B4

Trouble-shooting chart

Opel



# Trouble-shooting chart (continued)

## Customer complaint (fault symptom)

1. Starting motor operates, but engine fails to start

2. Rough idling

3. Poor throttle response

4. Engine lacks power

5. Misfiring

6. Fuel consumption too high

7. Engine pings when accelerating

8. Backfiring

9. Engine becomes too hot

									Cause of defect	Test instructions	Coordinates
			●		●	●			Leads for selection of characteristic curves not in order	-----	B 15
	●		●		●	●			Ecotronic control unit (selector for characteristic curves) not in order	-----	B 17
●	●	●	●	●	●	●	●	●	Basic ignition timing not in order	In order to avoid incorrect setting, be absolutely certain to run test according to coordinates indicated	B 15...B 20
				●					Ignition trigger box not in order	-----	B 23
●									Power supply f.ignition trigger box not in order	-----	C 1
●									Magnetic pulse generator not in order	-----	C 3... C 7
●									Timing advance device not in order	-----	C 8
●							●		Firing sequence not in order	see Auto Data test specifications	-----

**B5**

Trouble-shooting chart

Opel



**B6**

Trouble-shooting chart

Opel



## 9.5 Trouble-shooting program

Test primary signal. If no oscilloscope or tachometer available, check whether ignition spark across spark gap.

Primary signal testing with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions.

Start engine.

Oscilloscope must indicate a primary voltage (of any value).

Primary signal testing with tachometer

Connect tachometer to ignition coil as per operating instructions.

Start engine.

Tachometer must indicate a reading (of any value).

Ignition spark testing with spark gap

Remove H.T. ignition cable terminal 4 from ignition coil.

Connect spark gap including sleeve-type suppressor

(5 k $\Omega$ ) to ignition coil.

Adjust spark gap to 5 mm.

Start engine.

There must be sparks across the spark gap.

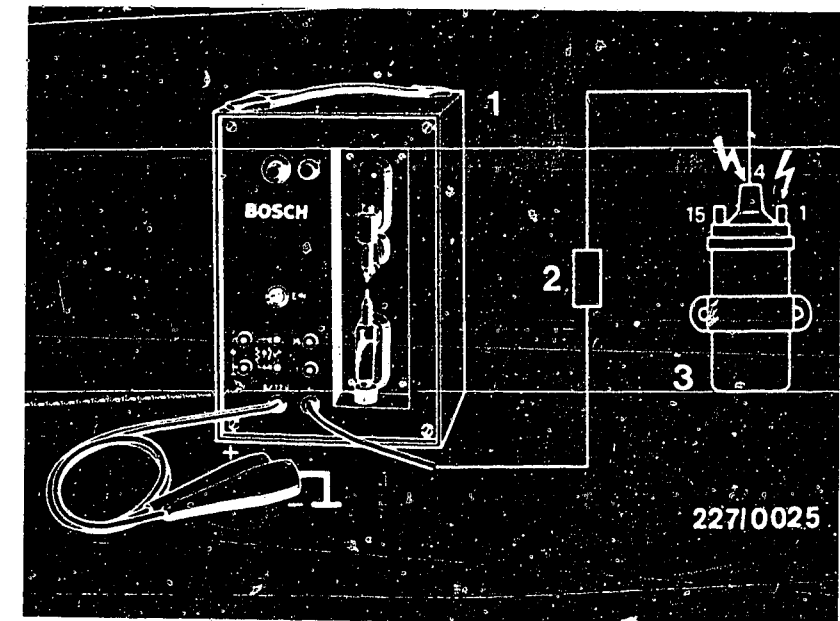
Primary signal present or ignition sparks across spark gap?

yes

Continued on B9/B10

If no primary signal or no ignition spark, continue testing at C 1.

Tests from B11 onwards not necessary.



1 = Spark gap  
2 = 5 k $\Omega$  sleeve-type suppressor  
3 = ignition coil

⚡ = dangerous voltages  
(400 V - 25 kV)

**B7**

Trouble-shooting program

Opel

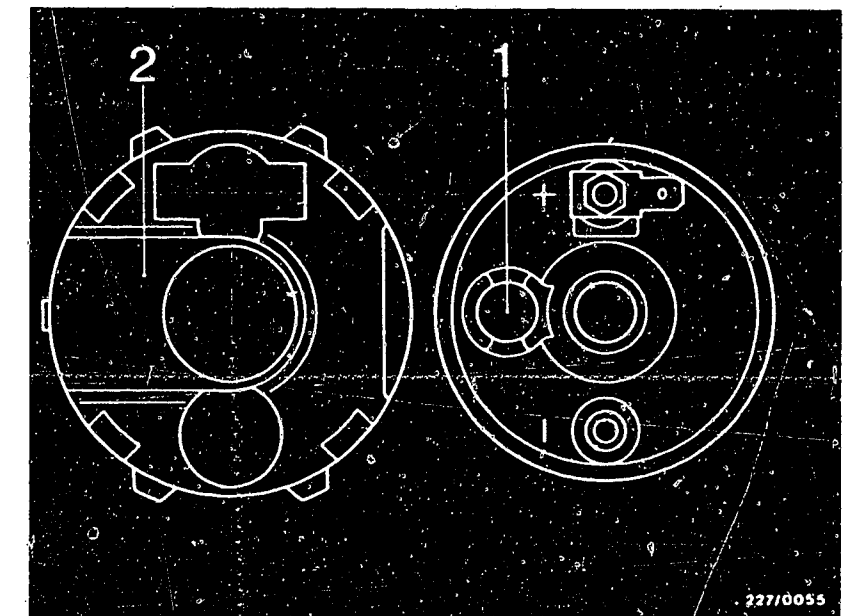
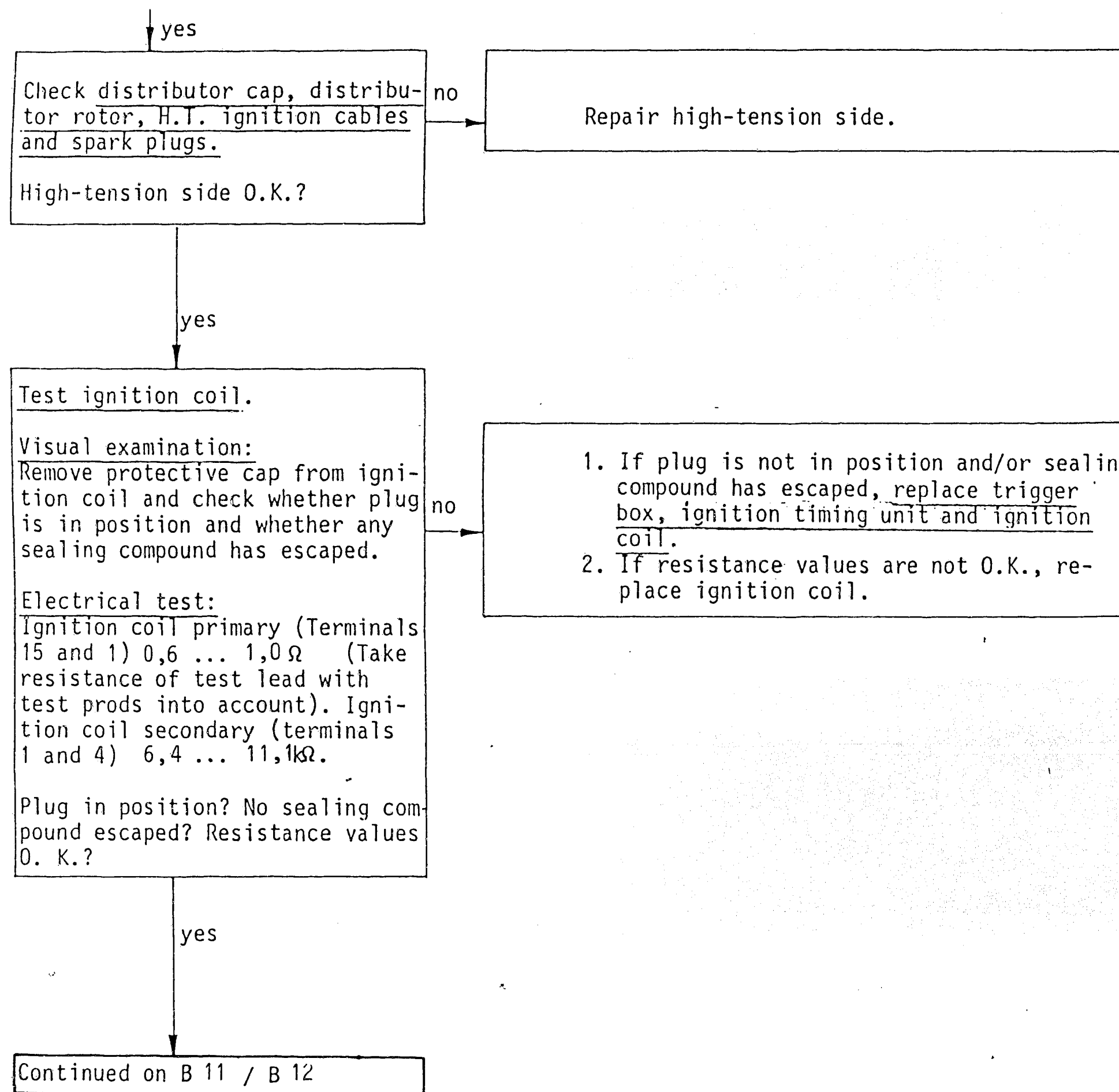


**B8**

Trouble-shooting program

Opel

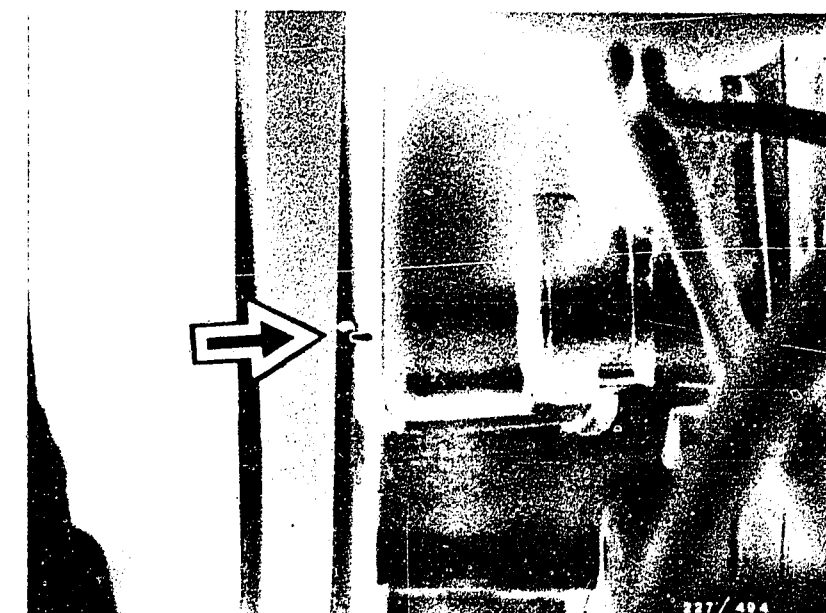
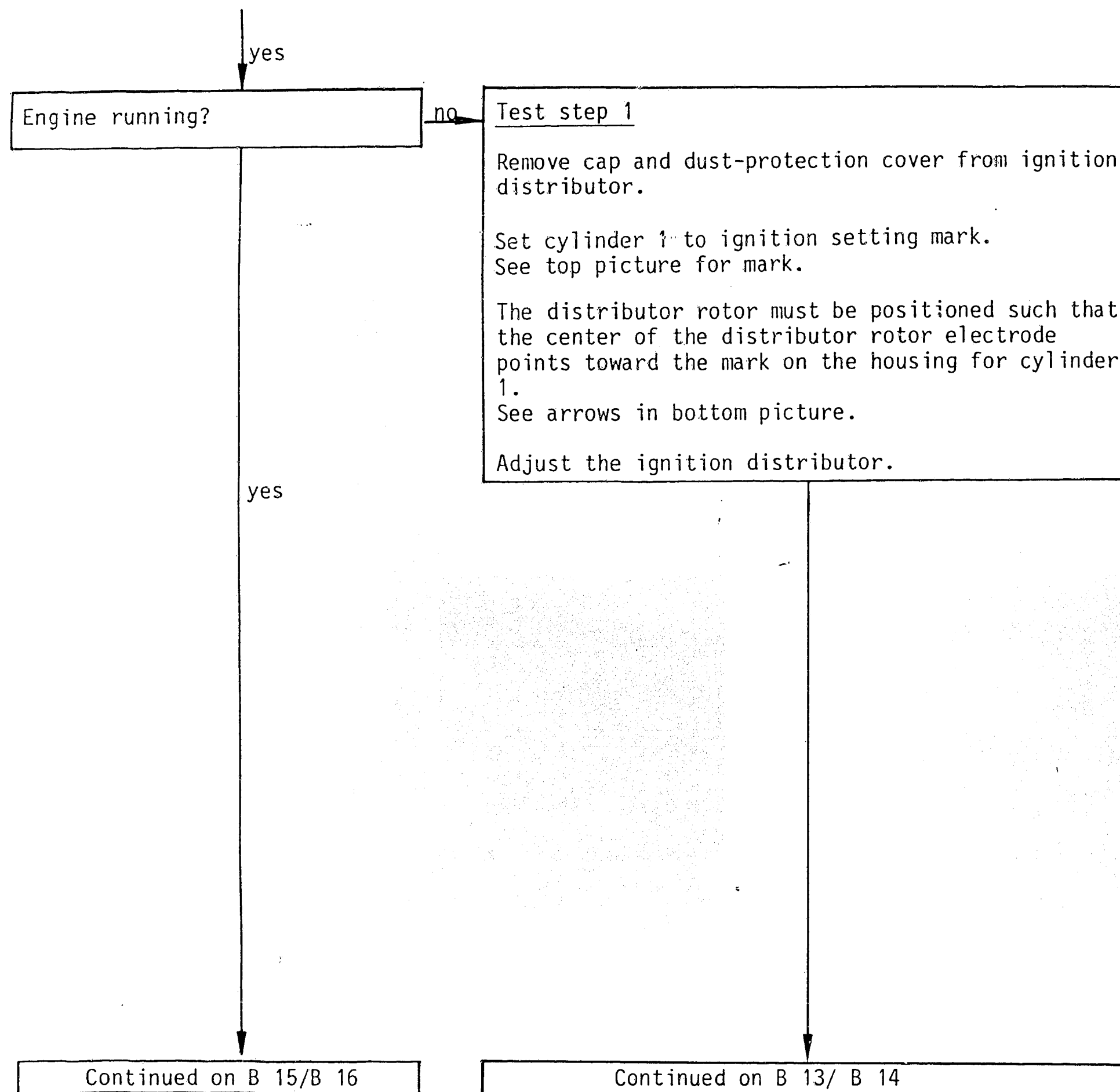




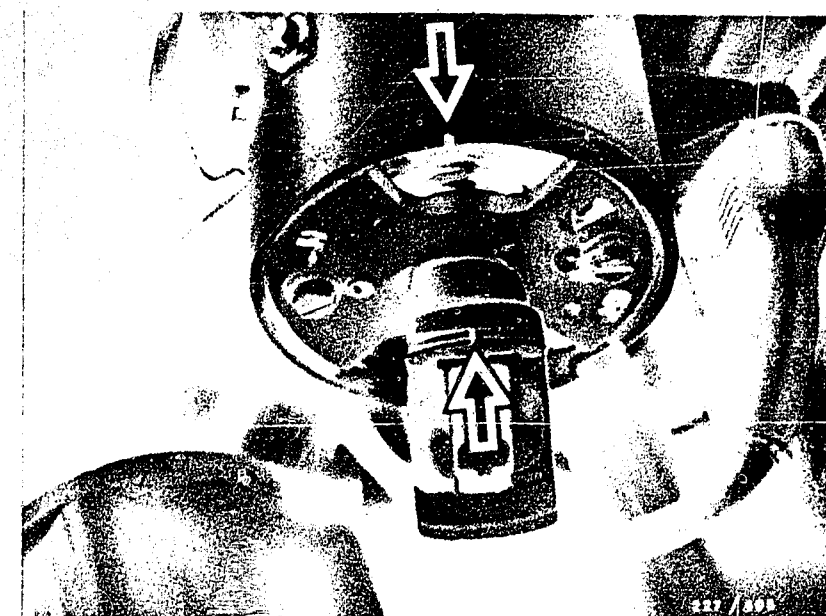
1 = Plug  
2 = Protective cap







Ignition timing mark (10° BTDC)



**B 11**

Trouble-shooting program  
Ope1



**B 12**

Trouble-shooting program  
Ope1



Continued

Test step 2

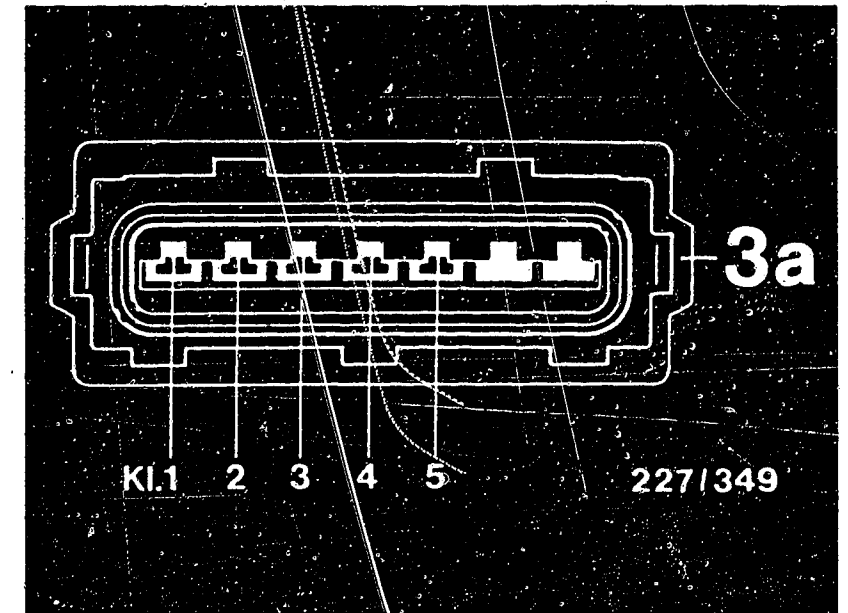
Disconnect negative and positive cables from battery. Remove windshield washer bottle. Disconnect trigger-box plug. Switch on ignition.

1. Check for contact resistance in cables from positive battery terminal to trigger-box plug term. 4 including cables from negative battery terminal to trigger-box plug term. 2. Total contact resistance max.  $0.3 \Omega$  (take resistance of test lead with test prods into account). Eliminate contact resistance.
2. Check for contact resistance in cables from positive battery terminal to ignition coil term. 15 as well as in cable from ignition coil term. 1 to trigger-box plug term. 1. Total contact resistance max.  $0.3 \Omega$  (take resistance of test lead with test prods into account). Eliminate contact resistance.

If test steps 1 and 2 O.K., replace trigger box.

Yes

Continued on B 15/B 16



3a = Trigger-box plug

**B 13**

Trouble-shooting program  
Opel



**B 14**

Trouble-shooting program  
Opel



yes

Check leads for selection of characteristic curves.

Switch off ignition.

Take out Ecotronic control unit and disconnect plug.

Connect ohmmeter one after the other to:

Ecotronic control unit plug		Ecotronic control unit plug
-----------------------------	--	-----------------------------

Term. 5	and	Term. 21
Term. 5	and	Term. 25
Term. 5	and	Term. 27

In each instance, the ohmmeter must indicate approx. 70 ... 120 k $\Omega$ .

Is the value for resistance in order?

no

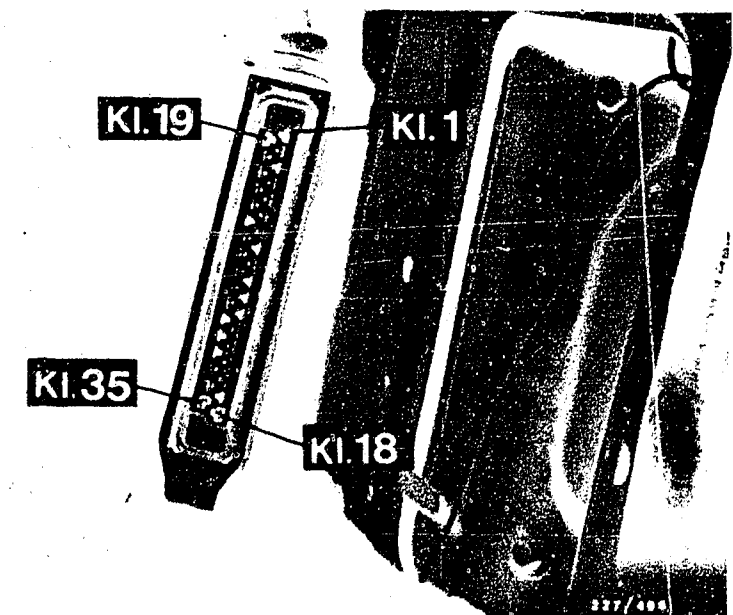
Take out the timing advance device and disconnect the plug. Connect the ohmmeter one after the other to:

Ecotronic control unit plug		Timing advance device plug
-----------------------------	--	----------------------------

Term. 21	and	Term. 6
Term. 25	and	Term. 14
Term. 27	and	Term. 7

In each instance, the ohmmeter must indicate approx. 0  $\Omega$  (continuity). Eliminate any break.

If there was no break found, take out and replace the ignition timing advance device.

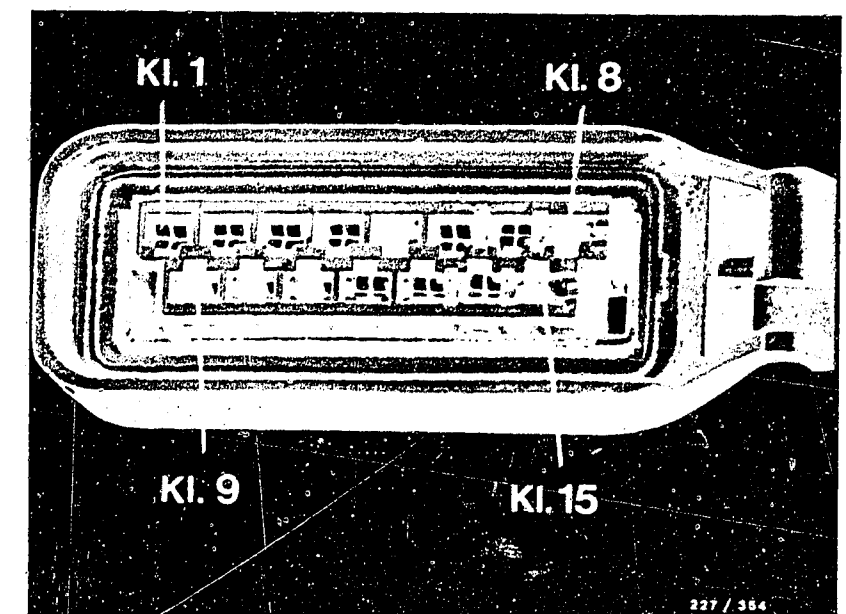


Ecotronic control unit plug  
KI. = Term.

Timing advance device plug

yes

Continued on B17/B18



**B 15**

Trouble-shooting plan

Opel



**B 16**

Trouble-shooting plan

Opel



yes

Ecotronic control unit (Checking selection of characteristic curves)

Plug in Ecotronic control unit plug.

The timing advance device plug is still plugged in.

Operate the engine until at normal operating temperature (temperature of oil > 60° C).

Take out the timing advance device and disconnect the plug.

Switch on the ignition.

Connect voltmeter one after the other to:

Timing advance  
device plug

Timing advance  
device plug

Term. 6(+)	and	Term. 1 (-)
Term. 7(+)	and	Term. 1 (-)
Term. 14(+)	and	Term. 1 (-)

In each instance the voltmeter must indicate approx. battery voltage.

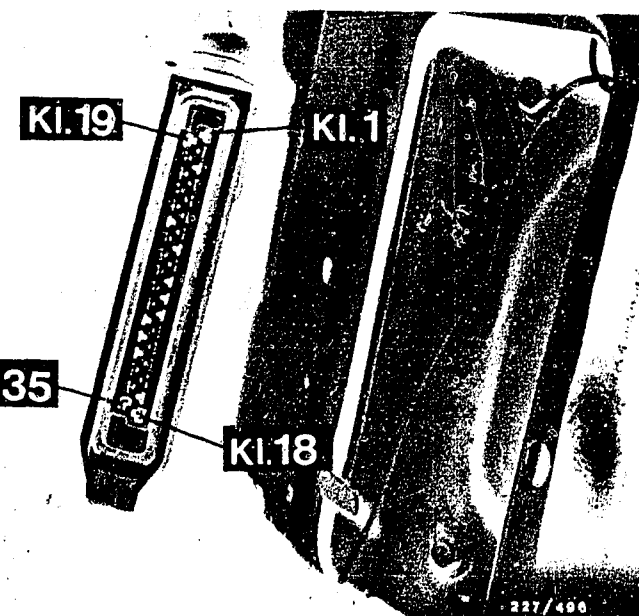
Are the voltage values in order in each case?

no

Check the Ecotronic unit according to the SIS microfiche.

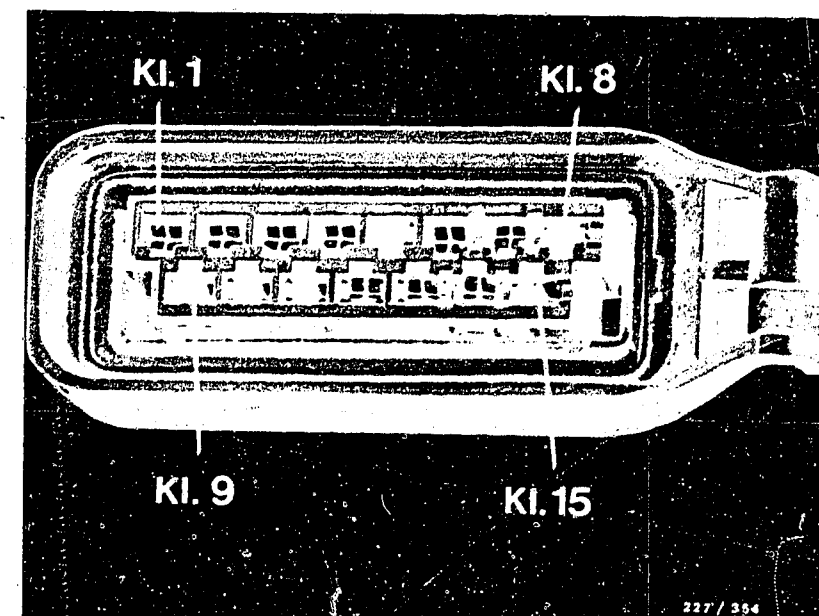
yes

Continued on B19/B20



Ecotronic control unit plug  
KI. = Term.

Timing advance device plug



**B17**

Trouble-shooting plan  
Opel



**B18**

Trouble-shooting plan  
Opel



yes

Check the basic ignition setting.

(If the reading shown on testers for rotational speed is clearly incorrect, put in a series resistor).

Plug in the timing advance device plug.

The engine must be at normal operating temperature (oil temperature  $> 60^{\circ}\text{C}$ ).

Run engine at  $800 \dots 1200 \text{ min}^{-1}$  (idle).

Note:

Specified value for idle speed for:

4-speed manual/automatic transmissions  
 $830 \pm 50 \text{ min}^{-1}$

5-speed manual transmissions  
 $930 \pm 50 \text{ min}^{-1}$

The idle speed is automatically controlled (not adjustable).

Flash at the ignition marker.

The marking on the crankshaft must align with the arrow.

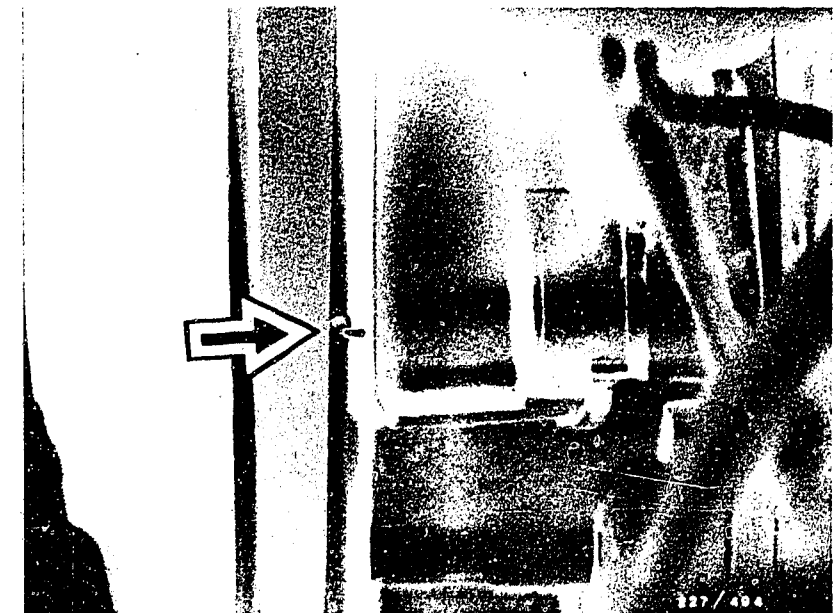
The marking corresponds to  $10^{\circ}$  crankshaft BTDC.

See arrow, figure at top.

Is the basic ignition setting in order?

no

Release the fastening for the ignition distributor and turn the ignition distributor until the markings align ( $10^{\circ}$  BTDC).



Ignition setting marker

yes

Continued on B21/B22

**B 19**

Trouble-shooting plan

Opel



**B 20**

Trouble-shooting plan

Opel



yes

Check power supply from ignition trigger box.

Take out the windshield washer reservoir. Unscrew the ignition coil and the cooling plate. Push back the rubber sleeve on the trigger box plug. See figure at top. Connect voltmeter to trigger box plug Term. 4 (+) and Term. 2 (-). Run engine at idle. The voltage measured must be battery voltage and must not be more than 1 V less than battery voltage.

Is the value for voltage in order?

yes

Test ignition coil voltage supply

Connect voltmeter to ignition coil term.15 and negative battery terminal.

Allow engine to idle. Measured voltage must be at least 10 V.

Voltage correct?

yes

Continued on B23/B24

No

Disconnect negative and positive cables from battery. Remove trigger-box plug. Switch on ignition.

Check for contact resistance in cables from positive battery terminal to trigger-box plug term. 4 including cables from negative battery terminal to trigger-box plug term.2. Total contact resistance max. 0.3  $\Omega$  (take resistance of test lead with test prods into account).

Eliminate contact resistance.

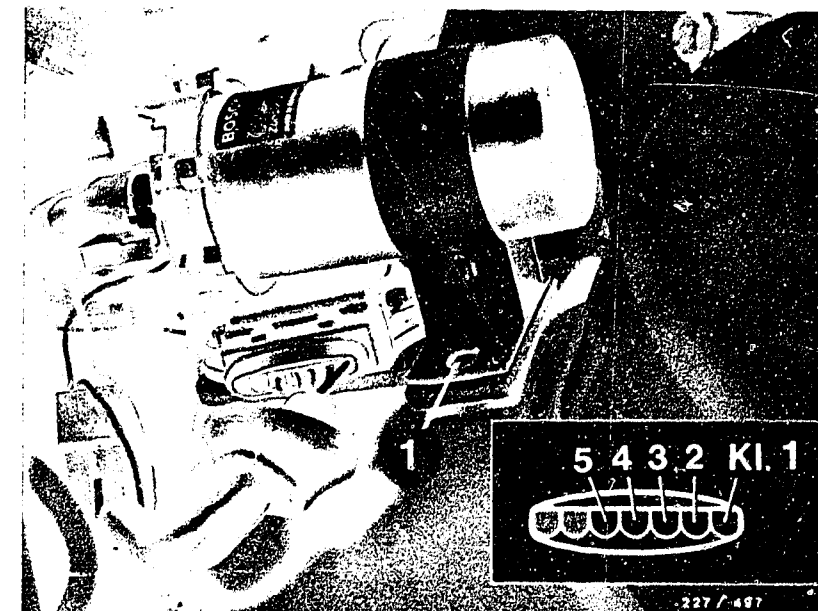
No

Disconnect positive cable from battery. Switch on ignition.

Check for contact resistance in cables from positive battery terminal to ignition coil term.15.

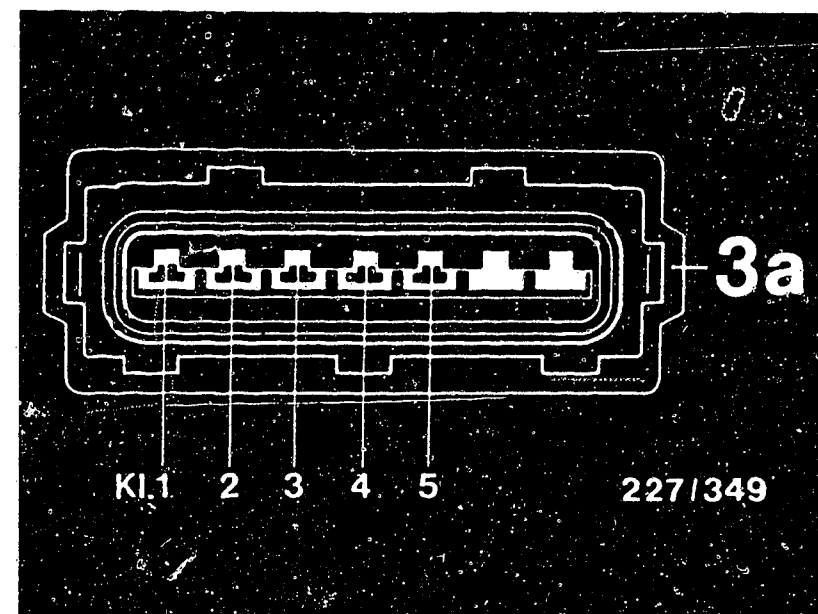
Contact resistance max. 0.3  $\Omega$ . (Take resistance of test lead with test prods into account).

Eliminate contact resistance.



1 = Ignition coil with cooling plate

3a = Trigger-box plug



B21

Trouble-shooting plan

Open



B22

Trouble-shooting plan

Open



yes

Test primary voltage.

(If MOT series available).  
Connect oscilloscope (e. g. MOT  
201) to ignition coil as per  
operating instructions.  
Allow engine to idle.  
Measured primary voltage must be  
295-365 V. See graph.

Voltage correct?

Replace trigger box.

yes

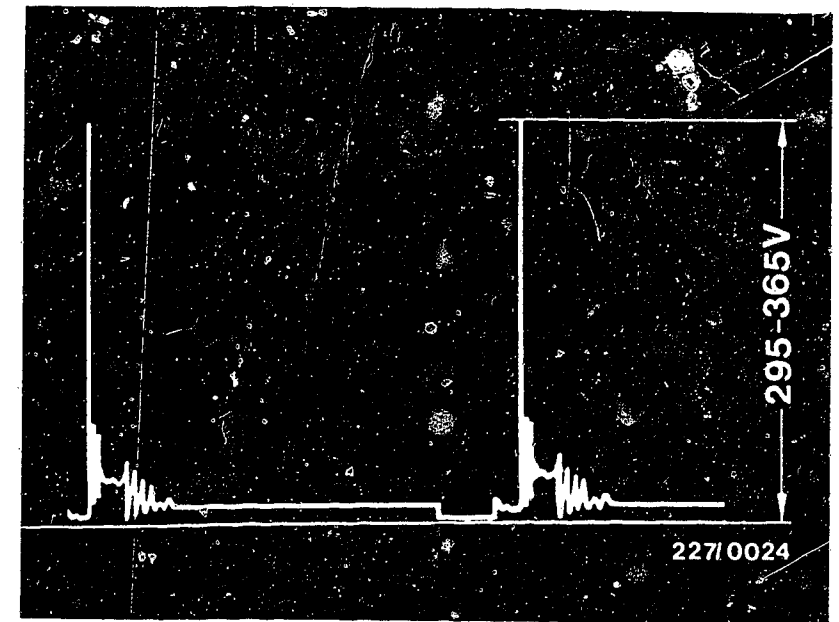
Ignition system O.K.

Test completed

Tests starting at C 1 no longer  
necessary.

Note:

If customer complaint is not  
yet remedied, then check for  
further possible faults in the  
fuel system, or engine not  
mechanically O.K.



**B23**

Trouble-shooting program



**B24**

Trouble-shooting program





No primary signal/no ignition spark  
(Continued from B 7/B 8 ).

Yes

Take out the windshield water reservoir.  
Unscrew the ignition coil with the cooling  
plate. See figure at top.  
Disconnect the trigger box plug.  
Connect voltmeter to trigger box plug be-  
tween Term. 4 (+) and Term. 2 (-).  
Turn on ignition.  
The voltmeter must indicate battery voltage.

No

Check for open circuit in cables and  
terminals from ignition and starting  
switch to trigger-box plug term. 4  
including ground cable term. 2.  
Eliminate open circuit. ,

Yes

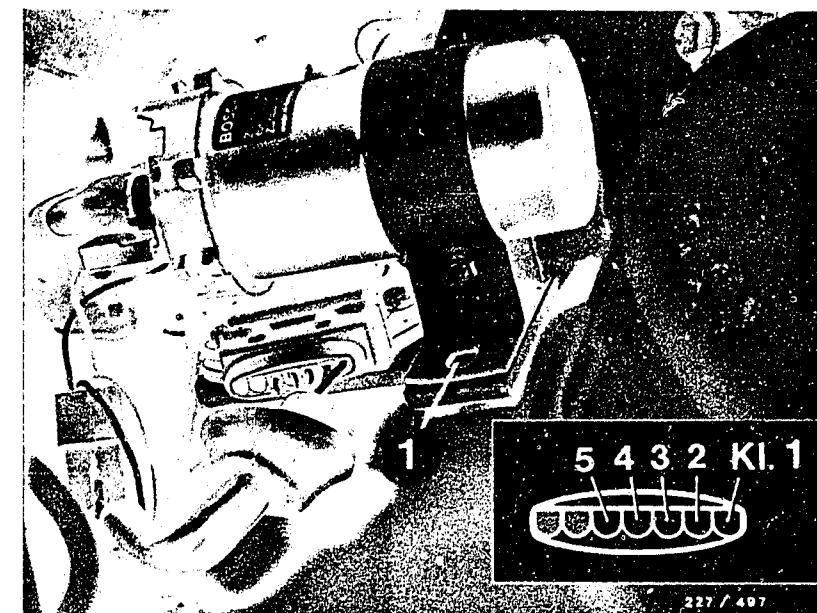
Test primary circuit.  
Connect voltmeter to disconnected  
trigger-box plug between term. 1 (+)  
and term. 2 (-).  
Switch on ignition.  
Voltmeter must indicate battery voltage.  
Voltage correct?

No

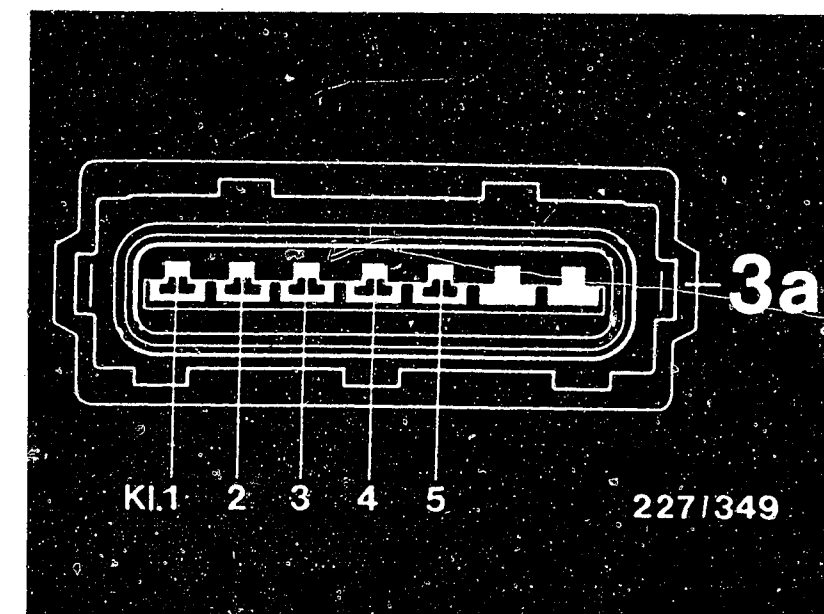
Check for open circuit in cable from  
ignition and starting switch to  
ignition coil term. 15, in the pri-  
mary winding of the ignition coil,  
in the cable from ignition coil term.  
1 to trigger-box plug term. 1 and in  
the ground cable term. 2.  
Eliminate open circuit.

Yes

Continued on C 3



3a = Trigger-box plug



C1

Trouble-shooting plan  
Open



C2

Trouble-shooting plan  
Open

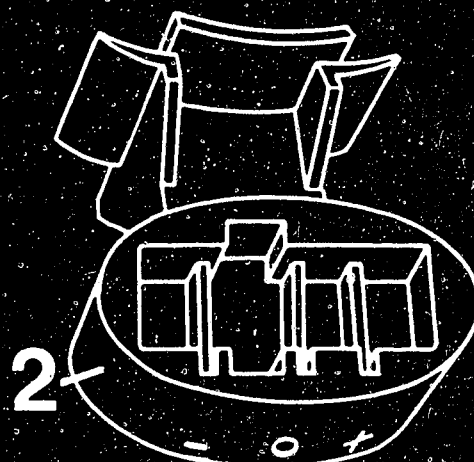
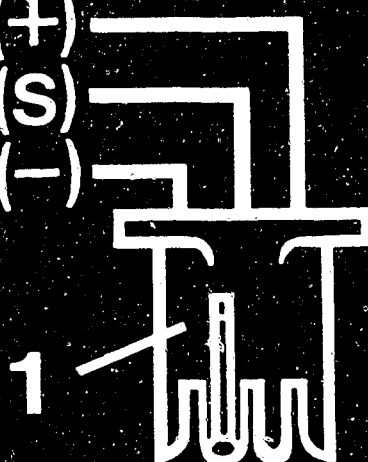




KI. 4(+)

KI. 12(S)

KI. 2(-)



227/357

1 = Ignition-distributor connector

2 = Ignition-distributor socket

yes

Test connector and socket of ignition distributor.

Visual examination:

Remove the ignition-distributor connector (see picture) and check contacts for oxidation and correct latching (remedy defects).

Reconnect ignition-distributor connector. If customer complaint not remedied, continue testing.

yes

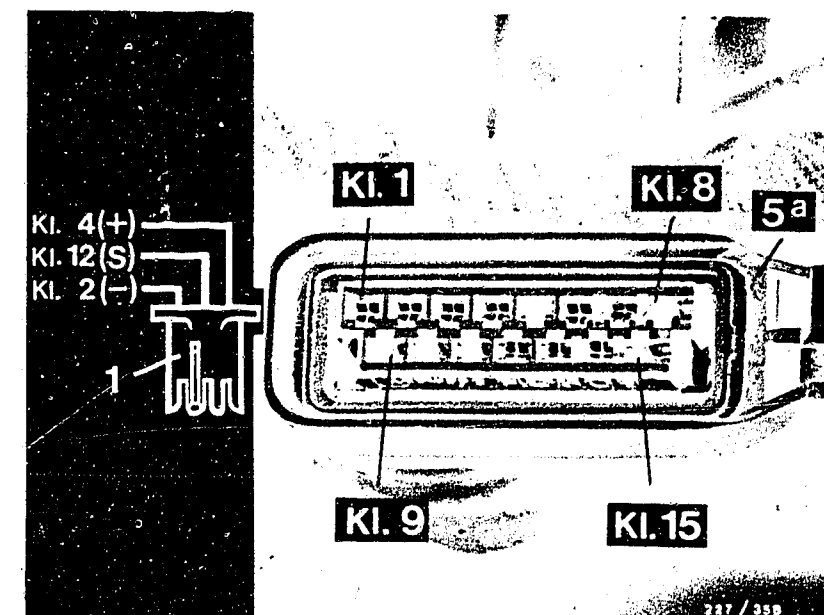
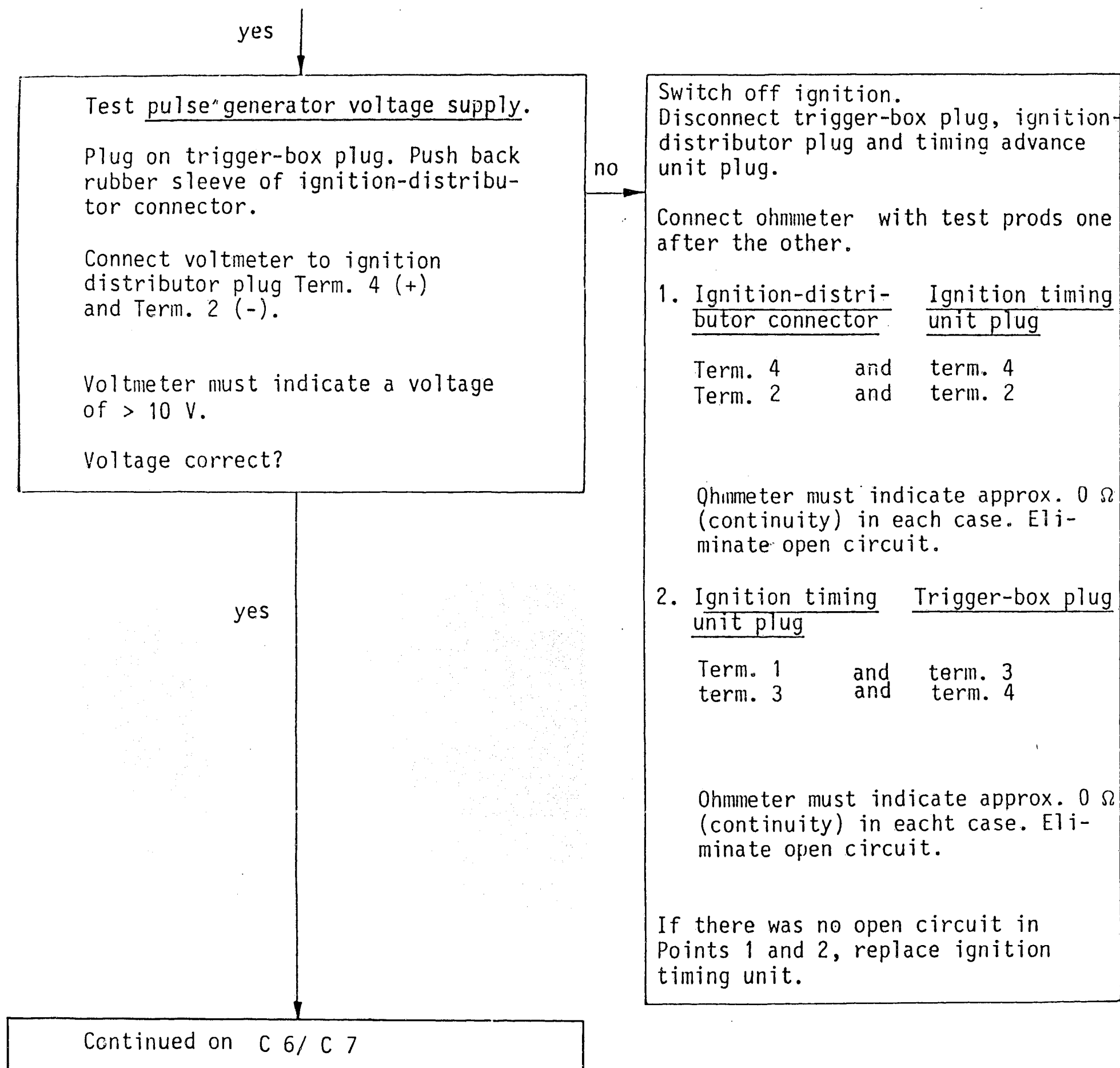
Continued on C 4/ C 5

**C3**

Trouble-shooting program

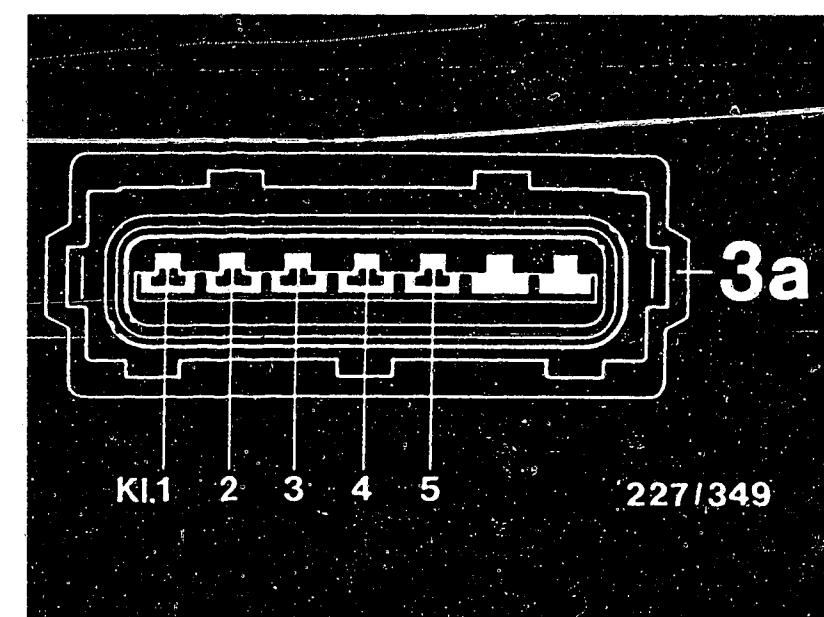
Open





1 = Ignition-distributor connector  
5a = Ignition timing unit plug

3a = Trigger-box plug



Yes

Test operation of pulse generator.

Trigger-box plug, ignition-distributor plug and timing advance unit plug connected.  
Push back rubber sleeve of ignition-distributor connector.

Connect oscilloscope as per operating instructions with program switch in "special" position.

For example, MOT 201:

Red terminal to ignition distributor plug  
Term. 12 (measurement signal).

Black clip to ground.

Start engine.

The oscilloscope must show a rectangular pulse. See graph.

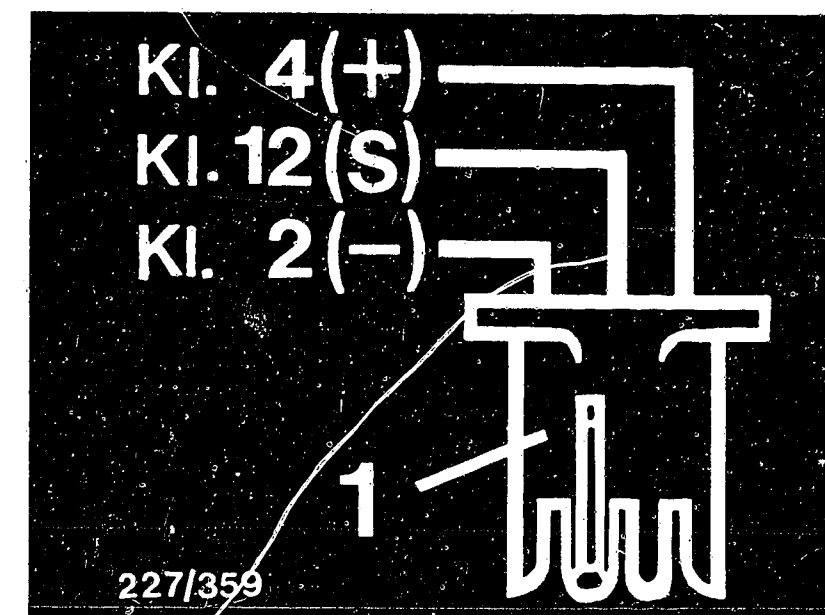
Rectangular pulse present?

no

Replace pulse generator/ignition distributor.

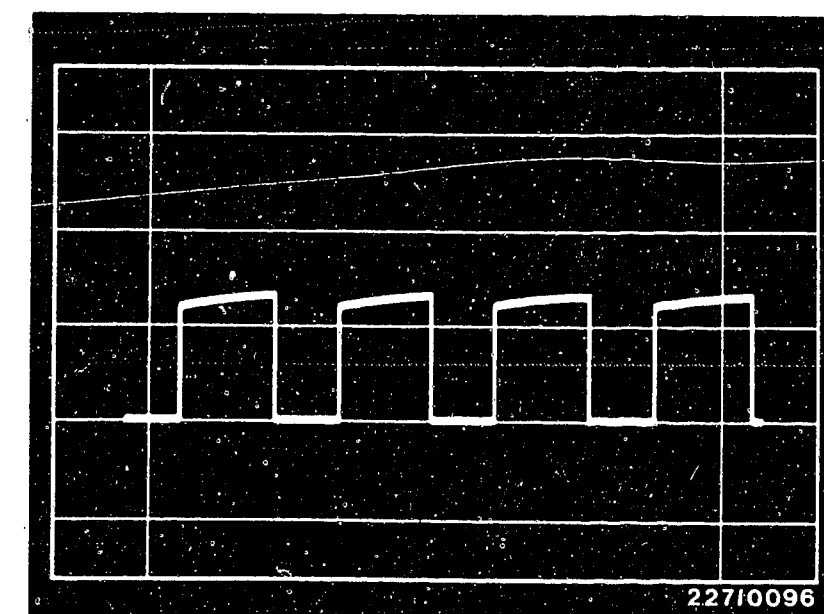
Yes

Continued on C 8/ C 9



1 = Ignition-distributor connector

Rectangular pulse



**C6**

Trouble-shooting plan  
Ope1



**C7**

Trouble-shooting plan  
Ope1



Yes

### Test operation of pulse generator.

Trigger-box plug, ignition-distributor plug and timing advance unit plug connected.  
Push back rubber sleeve of ignition-distributor connector.

Connect oscilloscope as per operating instructions with program switch in "special" position.

For example, MOT 201:

Red terminal to trigger box plug Term. 5 (measurement signal). See figure at top.

Black clip to ground.

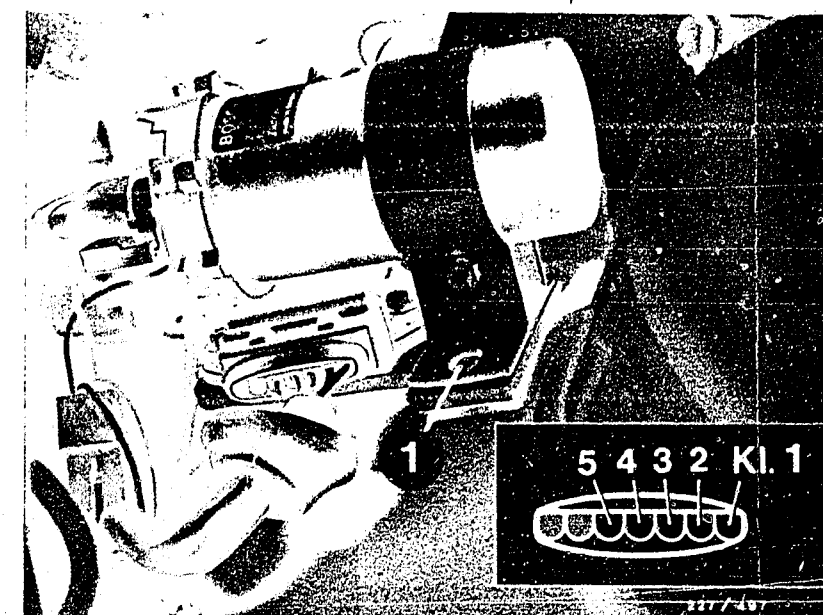
Start engine.

The oscilloscope must show a rectangular pulse. See graph.

Rectangular pulse present?

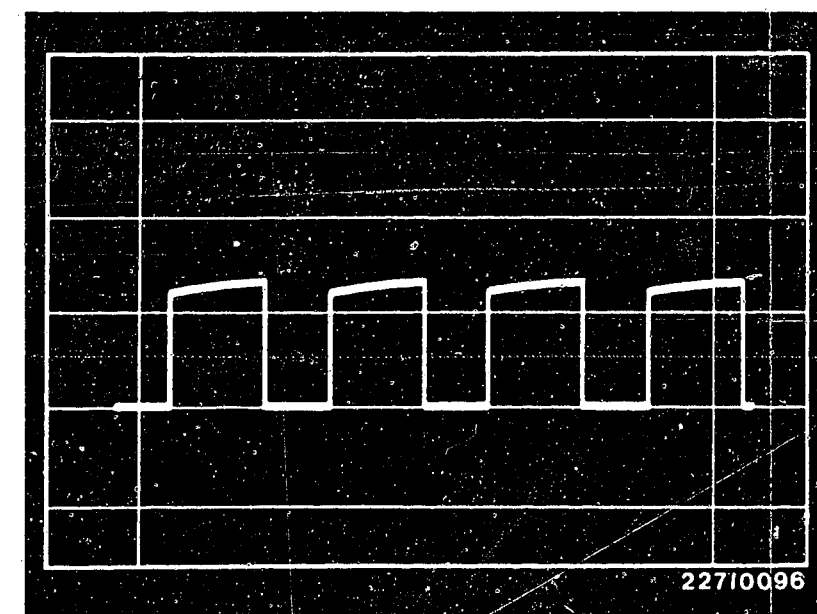
No

Switch off ignition.  
Disconnect trigger-box plug, ignition-distributor plug and timing advance unit plug.



3a = Trigger-box plug

Rectangular pulse



Continued on C 12/C 13

Continued on C 10/C 11

**C8**

Trouble-shooting plan  
Open



**C9**

Trouble-shooting plan  
Open



Continued

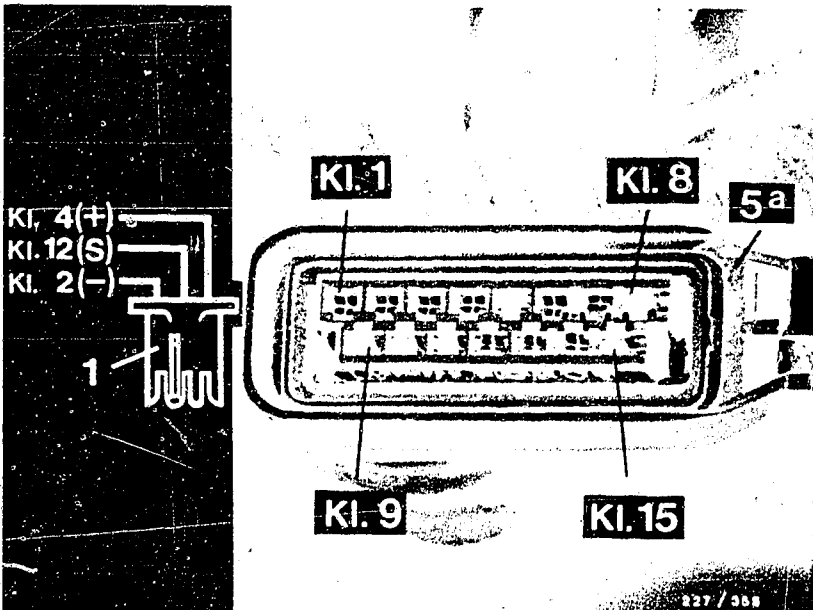
Connect ohmmeter consecutively to:

<u>Ignition-distributor connector</u>  Term. 12	and	<u>Ignition timing unit plug</u>  term. 12
<u>Ignition timing unit plug</u>  Term. 13	and	<u>Trigger-box plug</u>  term. 5

In each case, the ohmmeter must indicate approx. 0 Ω (continuity).

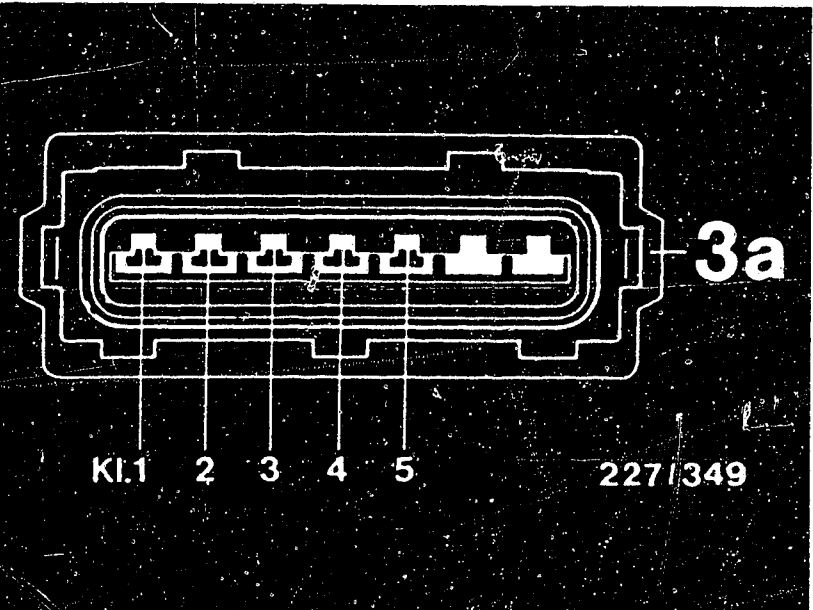
Eliminate open circuit.

If there was no open circuit, replace ignition timing unit.



1 = Ignition-distributor connector  
5a= Ignition timing unit plug

3a= Trigger-box plug



Continued on C 12 / D 13

Yes

Test ignition coil.

Visual examination:

Remove protective cap from ignition coil and check whether plug (see picture) is in position and whether any sealing compound has escaped.

Electrical test:

Ignition coil primary (term. 15 and term. 1) 0.6 ... 1,0  $\Omega$   
(take resistance of test lead with test prods into account).

Ignition coil secondary (term. 1 and term. 4) 6,4...11,1 k $\Omega$ .

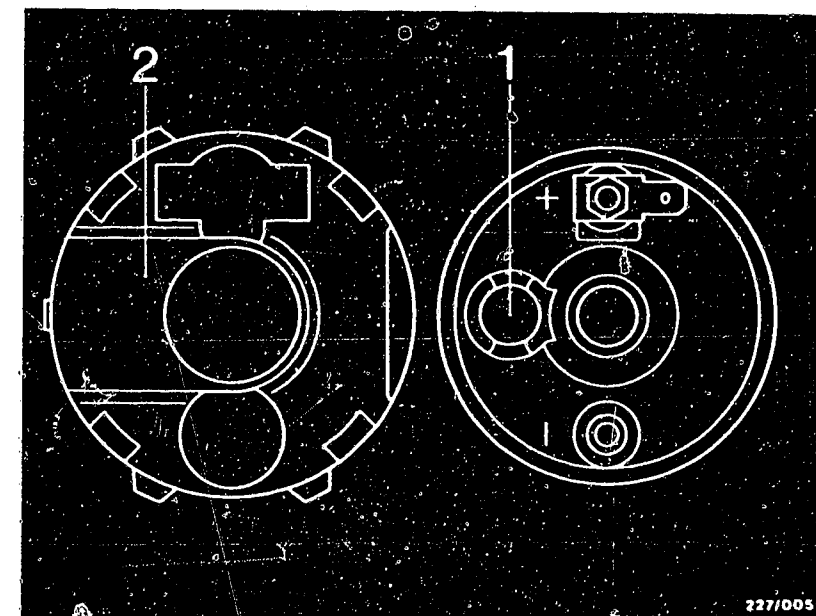
Plug in position? No sealing compound escaped?

Resistance value O.K.?

no

1. If plug is not in position and/or sealing compound has escaped, replace trigger-box, ignition timing unit and ignition coil.

2. If resistance values are not O.K., replace ignition coil.



1 = Plug  
2 = Protective cap

Yes

Replace trigger box.

Test completed.

Tests from B 9 not necessary.

Note:

If customer complaint is not yet remedied, then check for further possible faults in the fuel system, or engine not mechanically O. K.

**C12**

Trouble-shooting program

Opel



**C13**

Trouble-shooting program

Opel



# After-sales Service

## Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party.

22

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

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**Nr**

Technical Bulletin

Opel

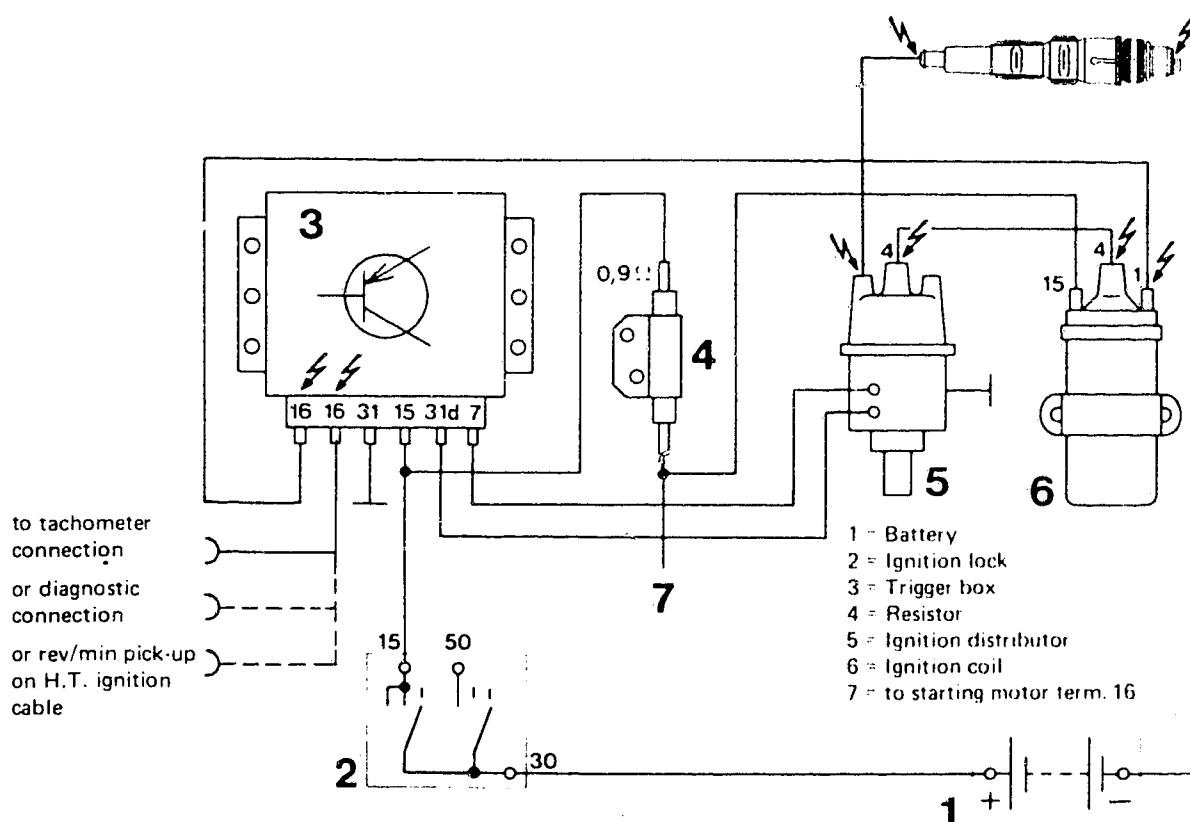


In addition, in the case of the capacitor-discharge ignition system (CDI), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram



# After-sales Service

## Technical Bulletin

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EFFECTS OF ELECTRICAL AND ELECTRONIC  
SYSTEMS ON HEART PACEMAKERS

VDT-I-227/107 En  
1.1981

e.g. ignition systems, Jetronic, Motronic, ABS

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).  
Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

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**N3**

Technical Bulletin

Open



We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.



# After-sales Service

## Technical Bulletin

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### BREAKERLESS TRANSISTORIZED IGNITION SYSTEM

22

Warranty note

VDT-I-227/103 En  
3.1979

Hybrid construction trigger boxes

0 227 100 100 for ignition distributor  
with Hall generator (TCI-h)  
0 227 100 102 for ignition distributor  
with induction-type  
pulse generator (TCI-i)

Apart from the well-known TCI trigger boxes 0 227 100 0.., trigger boxes of hybrid construction have been fitted as standard since 9.78 (Fig. 1).

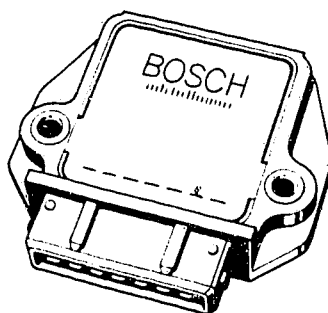


Fig. 1

#### Warranty procedure

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GMBH  
KH/LAV - Auspackraum

zur Weiterleitung an K1/VAK 21

D-7000 Stuttgart 30

This instruction remains valid until further notice.

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**N5**

Technical Bulletin

Opel



# After-sales Service

## Technical Bulletin

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### NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En

1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	-----	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-k (TCI-c)	k=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)

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**N6**

Technical Bulletin

Open



Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributorless ignition with or without knock control	VZ VZ-K	- K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

\*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

INCORRECT DISPLAY OF ROTATIONAL SPEED AND  
DWELL ANGLE ONLY WITH TRIGGER BOXES  
0 227 100 ... (TCI-i, TCI-h) WITH CURRENT  
LIMITATION

VDT-I-Gen. 030 En  
6.80  
Supersedes Ed. 3.80

For additional information see VDT-I-Gen. 032 En

### 1. General

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle when testing the ignition system. However, there is no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Incorrect displays may occur with the testers listed below:

MOT 001.00}	Rotational-speed	KTE 001.00
001.01}	display O.K. with these	001.02
001.02	testers	001.03
001.04		
002.00		

By now, the following vehicles may be fitted with breakerless ignition systems with current limitation:

Audi	(Bosch/Fairchild-ignition system)	Mazda	(Mitsubishi ignition system)
BMW	(Bosch ignition system)	Mitsubishi	(Mitsubishi ignition system)
Citroen	(Delco ignition system)	Nissan-Datsun	(Hitachi ignition system)
Fiat	(Delco ignition system)	Peugeot	(Bosch ignition system)
Ford	(Delco ignition system)	VW	(Bosch/Fairchild ignition system)
General-Motors	(HEI-ignition system)	Bosch transistorized ignition system for retrofitting 0 227 100 920	

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**N8**

Motor Vehicle Service Information  
Opel



## 2. Test instructions

### 2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min<sup>-1</sup> to 1200 min<sup>-1</sup>).

It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

### Suggestion for user manufacture

Required parts:

- i ballast resistor 0.9 Ohm
- or
- 1 ballast resistor 1.0 Ohm
- 2 blade receptacles e.g.
- approx. 0.2 m cable, 1.5 mm<sup>2</sup> e.g.
- 2 insulated clips

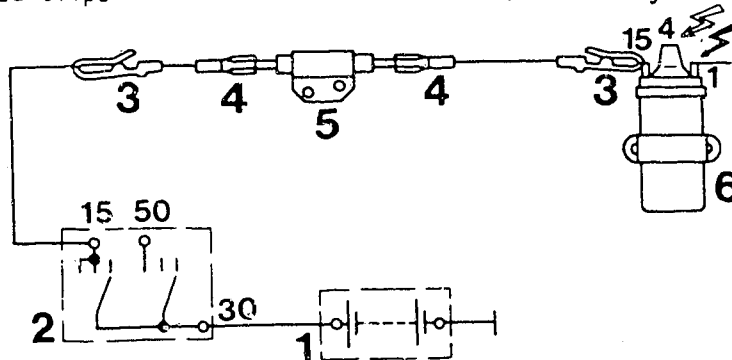
Part No. 0 227 900 002

Part No. 0 227 900 101

Part No. 1 901 355 881

Part No. 6 210 150 150

Commercially available



- 1 = Battery
- 2 = Ignition switch
- 3 = Clips

- 4 = Blade receptacle
- 5 = Ballast resistor
- 6 = Ignition coil

⚡ approx. 400 V

⚡ approx. 25 kV

### 2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

### 2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

### MOTORTESTER CONVERSION

Incorrect display of rotational speed,  
dwell angle and ignition point  
only with trigger boxes  
0 227 100 ... (TCI-i, TCI-h) with current  
limitation

VDT-I-Gen. 032 En  
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268  
268 S 10  
269  
214 B  
AE 2000

#### 1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

#### 2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

#### 3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

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**N10**

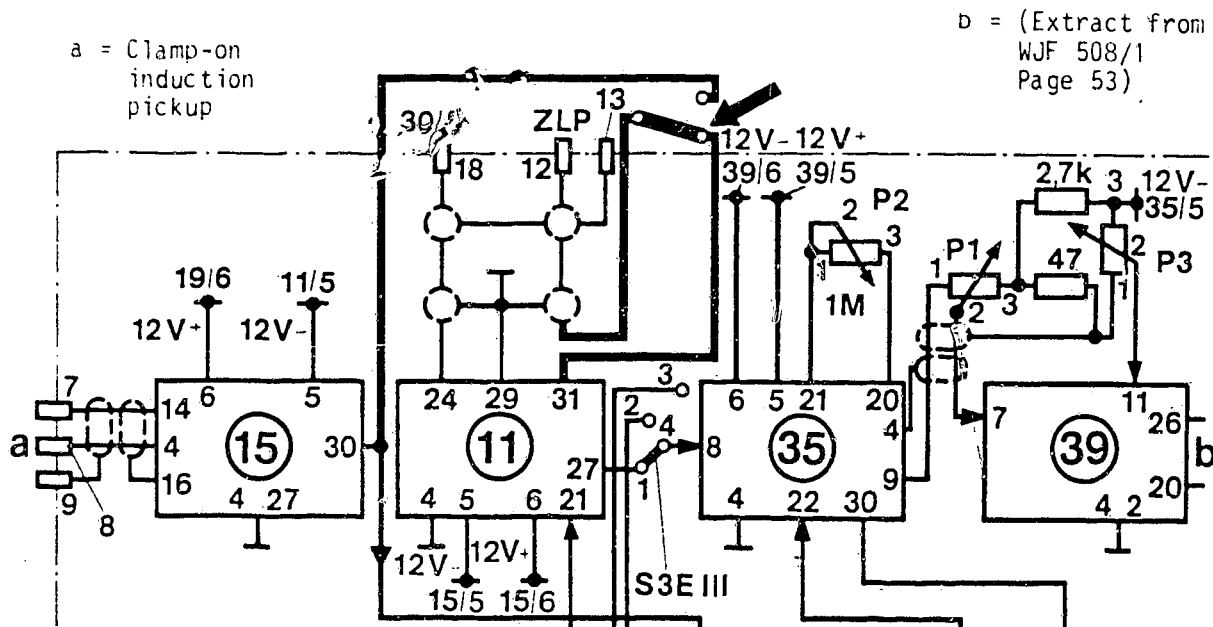
Motor Vehicle Service Information  
Opel





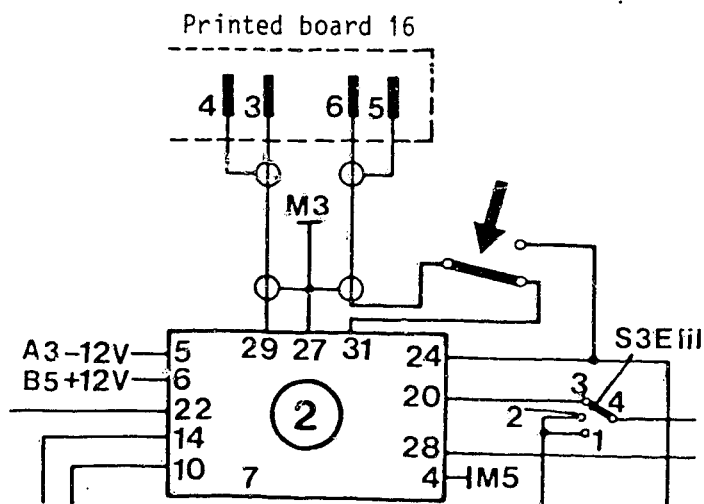
Remove the line of the ZLP\* from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.

\* ZLP = timing light



## EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.



By fitting the switch with change-over contact in the front panel of the motor-tester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly: e.g. "standard" - "current limitation". These conversion measures have already been published in the K7 information sheet KJF 28/7911.



#### 4. Test instructions

##### 4.1 Standard ignition systems

Switch position: "standard"

All other tester connections as per operating instructions.

##### 4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.



# After-sales Service

## Motor Vehicle Service Information

Only for use within the Bosch organization. Not to be communicated to any third party.

TESTS ON ELECTRONIC IGNITION SYSTEMS  
(TCI, TZ)  
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En  
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

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**N13**

Motor Vehicle Service Information  
Opel



# T A B L E   O F   C O N T E N T S

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6. Danger of accident on electronic ignition systems .....	A 10
7. Incorrect indication of engine speed, dwell angle and ignition point .....	A 14
8. Important vehicle information .	A 15
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Trouble-shooting chart .....	B 3
Trouble-shooting program if primary signal/ignition spark present .....	B 7
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